Mid-Puyallup Basin Plan

Volume 2 - Appendices

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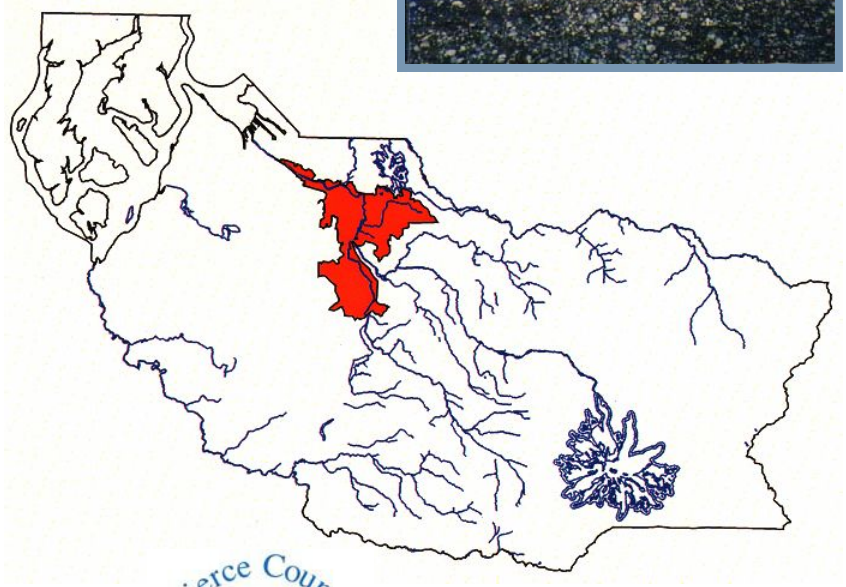


Pierce County
Public Works & Utilities
Water Programs Division

APPENDIX A

WASHINGTON STATE WATER QUALITY STANDARDS

Chapter 173-201A WAC

WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON

WAC

WAC 173-201A-010 Introduction. (1) The purpose of this chapter is to establish water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment thereof, and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW and the policies and purposes thereof.

(2) This chapter shall be reviewed periodically by the department and appropriate revisions shall be undertaken.

(3) The water use and quality criteria set forth in WAC 173-201A-030 through 173-201A-140 are established in conformance with present and potential water uses of the surface waters of the state of Washington and in consideration of the natural water quality potential and limitations of the same. Compliance with the surface water quality standards of the state of Washington require compliance with chapter 173-201A WAC, Water quality standards for surface waters of the state of Washington, and chapter 173-204 WAC, Sediment management standards.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-010, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-020 Definitions. The following definitions are intended to facilitate the use of chapter 173-201A WAC:

"Action value" means a total phosphorus (TP) value established at the upper limit of the trophic states in each ecoregion. Exceedance of an action value indicates that a problem is suspected. A lake-specific study may be needed to confirm if a nutrient problem exits.

"Acute conditions" are changes in the physical, chemical, or biologic environment which are expected or demonstrated to result in injury or death to an organism as a result of short-term exposure to the substance or detrimental environmental condition.

"AKART" is an acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART shall represent the most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. The concept of AKART applies to both point and nonpoint sources of pollution. The term "best management practices," typically applied to nonpoint source pollution controls is considered a subset of the AKART requirement. "The Stormwater Management Manual for the Puget Sound Basin" (1992), may be used as a guideline, to the extent appropriate, for developing best management practices to apply AKART for storm water discharges.

"Background conditions" means the biological, chemical, and physical conditions of a water body, outside the area of influence of the discharge under consideration. Background sampling locations in an enforcement action would be up-gradient or outside the area of influence of the discharge. If several discharges to any water body exist, and enforcement action is being taken for possible violations to the standards, background sampling would be undertaken immediately up-gradient from each discharge. When assessing background conditions in the headwaters of a disturbed watershed it may be necessary to use the background conditions of a neighboring or similar watershed as the reference conditions.

"Best management practices (BMP)" means physical, structural, and/or managerial practices approved by the department that, when used singularly or in combination, prevent or reduce pollutant discharges.

"Biological assessment" is an evaluation of the biological condition of a water body using surveys of aquatic community structure and function and other direct measurements of resident biota in surface waters.

"Bog" means those wetlands that are acidic, peat forming, and whose primary water source is precipitation, with little, if any, outflow.

"Carcinogen" means any substance or agent that produces or tends to produce cancer in humans. For implementation of this chapter, the term carcinogen will apply to substances on the United States Environmental Protection Agency lists of A (known human) and B (probable human) carcinogens, and any substance which causes a significant increased incidence of benign or malignant tumors in a single, well conducted animal bioassay, consistent with the weight of evidence approach specified in the United States Environmental Protection Agency's Guidelines for Carcinogenic Risk Assessment as set forth in 51 FR 33992 et seq. as presently published or as subsequently amended or republished.

"Chronic conditions" are changes in the physical, chemical, or biologic environment which are expected or demonstrated to result in injury or death to an organism as a result of

repeated or constant exposure over an extended period of time to a substance or detrimental environmental condition.

"Created wetlands" means those wetlands intentionally created from nonwetland sites to produce or replace natural wetland habitat.

"Critical condition" is when the physical, chemical, and biological characteristics of the receiving water environment interact with the effluent to produce the greatest potential adverse impact on aquatic biota and existing or characteristic water uses. For steady-state discharges to riverine systems the critical condition may be assumed to be equal to the 7Q10 flow event unless determined otherwise by the department.

"Damage to the ecosystem" means any demonstrated or predicted stress to aquatic or terrestrial organisms or communities of organisms which the department reasonably concludes may interfere in the health or survival success or natural structure of such populations. This stress may be due to, but is not limited to, alteration in habitat or changes in water temperature, chemistry, or turbidity, and shall consider the potential build up of discharge constituents or temporal increases in habitat alteration which may create such stress in the long term.

"Department" means the state of Washington department of ecology.

"Director" means the director of the state of Washington department of ecology.

"Drainage ditch" means that portion of a designed and constructed conveyance system that serves the purpose of transporting surplus water; this may include natural water courses or channels incorporated in the system design, but does not include the area adjacent to the water course or channel.

"Ecoregions" are defined using EPAs *Ecoregions of the Pacific Northwest* Document No. 600/3-86/033 July 1986 by Omernik and Gallant.

"Fecal coliform" means that portion of the coliform group which is present in the intestinal tracts and feces of warm-blooded animals as detected by the product of acid or gas from lactose in a suitable culture medium within twenty-four hours at 44.5 plus or minus 0.2 degrees Celsius.

"Geometric mean" means either the nth root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.

"Ground water exchange" means the discharge and recharge of ground water to a surface water. Discharge is inflow from an aquifer, seeps or springs that increases the available supply of surface water. Recharge is outflow downgradient to an aquifer or downstream to surface water for base flow maintenance. Exchange may include ground water discharge in one season followed by recharge later in the year.

"Hardness" means a measure of the calcium and magnesium salts present in water. For purposes of this chapter, hardness is measured in milligrams per liter and expressed as calcium carbonate ($CaCO_3$).

"Irrigation ditch" means that portion of a designed and constructed conveyance system that serves the purpose of transporting irrigation water from its supply source to its place of use; this may include natural water courses or channels incorporated in the system design, but does not include the area adjacent to the water course or channel.

"Lakes" shall be distinguished from riverine systems as being water bodies, including reservoirs, with a mean detention time of greater than fifteen days.

"Lake-specific study" means a study intended to quantify existing nutrient concentrations, determine existing characteristic uses for lake class waters, and potential lake uses. The study determines how to protect these uses and if any uses are lost or impaired because of nutrients, algae, or aquatic plants. An appropriate study must recommend a criterion for total phosphorus (TP), total nitrogen (TN) in µg/l, or other nutrient that impairs characteristic uses by causing excessive algae blooms or aquatic plant growth.

"Mean detention time" means the time obtained by dividing a reservoir's mean annual minimum total storage by the thirty-day ten-year low-flow from the reservoir.

"Migration or translocation" means any natural movement of an organism or community of organisms from one locality to another locality.

"Mixing zone" means that portion of a water body adjacent to an effluent outfall where mixing results in the dilution of the effluent with the receiving water. Water quality criteria may be exceeded in a mixing zone as conditioned and provided for in WAC 173-201A-100.

"Natural conditions" or "natural background levels" means surface water quality that was present before any human-caused pollution. When estimating natural conditions in the headwaters of a disturbed watershed it may be necessary to use the less disturbed conditions of a neighboring or similar watershed as a reference condition.

"Nonpoint source" means pollution that enters any waters of the state from any dispersed land-based or water-based activities, including but not limited to atmospheric deposition, surface water runoff from agricultural lands, urban areas, or forest lands, subsurface or underground sources, or discharges from boats or marine vessels not otherwise regulated under the National Pollutant Discharge Elimination System program.

"Permit" means a document issued pursuant to RCW 90.48.160 et seq. or RCW 90.48.260 or both, specifying the waste treatment and control requirements and waste discharge conditions.

"pH" means the negative logarithm of the hydrogen ion concentration.

"Pollution" means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish, or other aquatic life.

"Primary contact recreation" means activities where a person would have direct contact with water to the point of complete submergence including, but not limited to, skin diving, swimming, and water skiing.

"Secondary contact recreation" means activities where a person's water contact would be limited (wading or fishing) to the extent that bacterial infections of eyes, ears, respiratory or digestive systems, or urogenital areas would normally be avoided.

"Shoreline stabilization" means the anchoring of soil at the water's edge, or in shallow water, by fibrous plant root complexes; this may include long-term accretion of sediment or peat, along with shoreline progradation in such areas.

"Storm water" means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

"Storm water attenuation" means the process by which peak flows from precipitation are reduced and runoff velocities are slowed as a result of passing through a surface waterbody.

"Surface waters of the state" includes lakes, rivers, ponds, streams, inland waters, saltwaters, wetlands and all other surface waters and water courses within the jurisdiction of the state of Washington.

"Temperature" means water temperature expressed in degrees Celsius (°C).

"Treatment wetlands" means those wetlands intentionally constructed on nonwetland sites and managed for the primary purpose of wastewater or storm water treatment. Treatment wetlands are considered part of a collection and treatment system, and generally are not subject to the criteria of this chapter.

"Trophic state" means a classification of the productivity of a lake ecosystem. Lake productivity depends on the amount of biologically available nutrients in water and sediments and may be based on total phosphorus (TP). Secchi depth and chlorophyll-a measurements may be used to improve the trophic state classification of a lake. Trophic states used in this rule include, from least to most nutrient rich, ultra-oligotrophic, oligotrophic, lower mesotrophic, upper mesotrophic, and eutrophic.

"Turbidity" means the clarity of water expressed as nephelometric turbidity units (NTU) and measured with a calibrated turbidimeter.

"Upwelling" means the natural process along Washington's Pacific Coast where the summer prevailing northerly winds produce a seaward transport of surface water. Cold, deeper more saline waters rich in nutrients and low in dissolved oxygen, rise to replace the surface water. The cold oxygen deficient water enters Puget Sound and other coastal estuaries at depth where it displaces the existing deep water and eventually rises to replace the surface water. Such surface water replacement results in an overall increase in salinity and nutrients accompanied by a depression in dissolved oxygen. Localized upwelling of the deeper water of Puget Sound can occur year-round under influence of tidal currents, winds, and geomorphic features.

"USEPA" means the United States Environmental Protection Agency.

"Wetlands" means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands. (Waterbodies not included in the definition of wetlands as well as those mentioned in the definition are still waters of the state.)

"Wildlife habitat" means waters of the state used by, or that directly or indirectly provide food support to, fish, other aquatic life, and wildlife for any life history stage or activity.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-020, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-020, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-030 General water use and criteria classes. The following criteria shall apply to the various classes of surface waters in the state of Washington:

(1) **Class AA (extraordinary).**

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 9.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 16.0°C (freshwater) or 13.0°C (marine water) due to human activities. When natural conditions exceed 16.0°C (freshwater) and 13.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=23/(T+5) (freshwater) or t=8/(T-4) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) **Class A (excellent).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 8.0 mg/L.

(B) Marine water - dissolved oxygen shall exceed 6.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 6.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 18.0°C (freshwater) or 16.0°C (marine water) due to human activities. When natural conditions exceed 18.0°C (freshwater) and 16.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) **Class B (good).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial and agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing and spawning.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 Ml.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 6.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 5.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 5.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 21.0°C (freshwater) or 19.0°C (marine water) due to human activities. When natural conditions exceed 21.0°C (freshwater) and 19.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=34/(T+9) (freshwater) or t=16/(T) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) and 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.

(4) **Class C (fair).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial).

(ii) Fish (salmonid and other fish migration).

(iii) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(iv) Commerce and navigation.

(c) Water quality criteria - marine water:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(ii) Dissolved oxygen shall exceed 4.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 4.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Temperature shall not exceed 22.0°C due to human activities. When natural conditions exceed 22.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases shall not, at any time, exceed t=20/(T+2).

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(iv) pH shall be within the range of 6.5 to 9.0 with a human-caused variation within a range of less than 0.5 units.

(v) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vi) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(vii) Aesthetic values shall not be interfered with by the presence of obnoxious wastes, slimes, aquatic growths, or materials which will taint the flesh of edible species.

(5) **Lake class.**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(ii) Dissolved oxygen - no measurable decrease from natural conditions.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature - no measurable change from natural conditions.

(v) pH - no measurable change from natural conditions.

(vi) Turbidity shall not exceed 5 NTU over background conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(6) **Establishing lake nutrient criteria.**

(a) The following table shall be used to aid in establishing nutrient criteria:

(WAC 173-201A-030, Table 1) See table on following page.

Ch. 173-201A-030, Table 1

Coast Range, Puget Lowlands, and Northern Rockies Ecoregions:

Trophic State	If Ambient TP (µg/) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
Action Value		
>20	lake specific study may be initiated	

Cascades Ecoregion:

Trophic State	If Ambient TP (µg/) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Action Value		
>10	lake specific study may be initiated	

Columbia Basin Ecoregion:

Trophic State	If Ambient TP (µg/) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
Upper mesotrophic	>20-35	35 or less
Action Value		
>35	lake specific study may be initiated.	

Lakes in the Willamette, East Cascade Foothills, or Blue Mountain ecoregions do not have recommended values and need to have lake-specific studies in order to receive criteria as described in (c)(i) of this subsection.

(b) The following actions are recommended if ambient monitoring of a lake shows the epilimnetic total phosphorus concentration, as shown in Table 1 of this section, is below the action value for an ecoregion:

(i) Determine trophic status from existing or newly gathered data. The recommended minimum sampling to determine trophic status is calculated as the mean of four or more samples collected from the epilimnion between June through September in one or more consecutive years. Sampling must be spread throughout the season.

(ii) Propose criteria at or below the upper limit of the trophic state; or

(iii) Conduct lake-specific study to determine and propose to adopt appropriate criteria as described in (c) of this subsection.

(c) The following actions are recommended if ambient monitoring of a lake shows total phosphorus to exceed the action value for an ecoregion shown in Table 1 of this section or where recommended ecoregional action values do not exist:

(i) Conduct a lake-specific study to evaluate the characteristic uses of the lake. A lake-specific study may vary depending on the source or threat of impairment. Phytoplankton blooms, toxic phytoplankton, or excessive aquatic plants, are examples of various sources of impairment. The following are examples of quantitative measures that a study may describe: Total phosphorus, total nitrogen, chlorophyll-a, dissolved oxygen in the hypolimnion if thermally stratified, pH, hardness, or other measures of existing conditions and potential changes in any one of these parameters.

(ii) Determine appropriate total phosphorus concentrations or other nutrient criteria to protect characteristic lake uses. If the existing total phosphorus concentration is protective of characteristic lake uses, then set criteria at existing total phosphorus concentration. If the existing total phosphorus concentration is not protective of the existing characteristic lake uses, then set criteria at a protective concentration. Proposals to adopt appropriate total phosphorus criteria to protect characteristic uses must be developed by considering technical information and stakeholder input as part of a public involvement process equivalent to the Administrative Procedure Act (chapter 34.05 RCW).

(iii) Determine if the proposed total phosphorus criteria necessary to protect characteristic uses is achievable. If the recommended criterion is not achievable and if the characteristic use the criterion is intended to protect is not an existing use, then a higher criterion may be proposed in conformance with 40 CFR part 131.10.

(d) The department will consider proposed lake-specific nutrient criteria during any water quality standards rule making that follows development of a proposal. Adoption by rule formally establishes the criteria for that lake.

(e) Prioritization and investigation of lakes by the department will be initiated by listing problem lakes in a watershed needs assessment, and scheduled as part of the water quality program's watershed approach to pollution control. This prioritization will apply to lakes identified as warranting a criteria based on the results of a lake-specific study, to lakes warranting a lake-specific study for establishing criteria, and to lakes requiring restoration and pollution control measures due to exceedance of an established criterion. The adoption of nutrient criteria are generally not intended to apply to lakes or ponds with a surface area smaller than five acres; or to ponds wholly contained on private property owned and surrounded by a single landowner; and nutrients do not drain or leach from these lakes or private ponds to the detriment of other property owners or other water bodies; and do not impact designated uses in the lake. However, if the landowner proposes criteria the department may consider adoption.

(f) The department may not need to set a lake-specific criteria or further investigate a lake if existing water quality conditions are naturally poorer (higher TP) than the action value and uses have not been lost or degraded, per WAC 173-201A-070(2).

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-030, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-030, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-040 Toxic substances. (1) Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.

(2) The department shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with subsection (1) of this section and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

(3) The following criteria shall be applied to all surface waters of the state of Washington for the protection of aquatic life. The department may revise the following criteria on a state-wide or waterbody-specific basis as needed to protect aquatic life occurring in waters of the state and to increase the technical accuracy of the criteria being applied. The department shall formally adopt any appropriate revised criteria as part of this chapter in accordance with the provisions established in chapter 34.05 RCW, the Administrative Procedure Act. The department shall ensure there are early opportunities for public review and comment on proposals to develop revised criteria. Values are µg/L for all substances except Ammonia and Chloride which are mg/L:

	Freshwater		Marine Water	
Substance	Acute	Chronic	Acute	Chronic
Aldrin/Dieldrin	2.5a	0.0019b	0.71a	0.0019b
Ammonia (un-ionized NH3) hh	f,c	g,d	0.233h,c	0.035h,d
Arsenic dd	360.0c	190.0d	69.0c,ll	36.0d, cc,ll
Cadmium dd	i,c	j,d	42.0c	9.3d
Chlordane	2.4a	0.0043b	0.09a	0.004b

Substance	Freshwater Acute	Freshwater Chronic	Marine Water Acute	Marine Water Chronic
Chloride (Dissolved) k	860.0h,c	230.0h,d	-	-
Chlorine (Total Residual)	19.0c	11.0d	13.0c	7.5d
Chlorpyrifos	0.083c	0.041d	0.011c	0.0056d
Chromium (Hex) dd	15.0c,l,ii	10.0d,jj	1,100.0c,l,ll	50.0d,ll
Chromium (Tri) gg	m,c	n,d	-	-
Copper dd	o,c	p,d	4.8c,ll	3.1d,ll
Cyanide ee	22.0c	5.2d	1.0c,mm	-
DDT (and metabolites)	1.1a	0.001b	0.13a	0.001b
Dieldrin/Aldrin e	2.5a	0.0019b	0.71a	0.0019b
Endosulfan	0.22a	0.056b	0.034a	0.0087b
Endrin	0.18a	0.0023b	0.037a	0.0023b
Heptachlor	0.52a	0.0038b	0.053a	0.0036b
Hexachlorocyclohexane (Lindane)	2.0a	0.08b	0.16a	-
Lead dd	q,c	r,d	210.0c,ll	8.1d,ll
Mercury s	2.1c,kk,dd	0.012d,ff	1.8c,ll,dd	0.025d,ff
Nickel dd	t,c	u,d	74.0c,ll	8.2d,ll
Parathion	0.065c	0.013d	-	-
Pentachlorophenol (PCP)	w,c	v,d	13.0c	7.9d
Polychlorinated Biphenyls (PCBs)	2.0b	0.014b	10.0b	0.030b
Selenium	20.0c,ff	5.0d,ff	290c,ll,dd	71.0d, x,ll,dd
Silver dd	y,a	-	1.9a,ll	-
Toxaphene	0.73c,z	0.0002d	0.21c,z	0.0002d
Zinc dd	aa,c	bb,d	90.0c,ll	81.0d,ll

Notes to Table:

a.An instantaneous concentration not to be exceeded at any time.

b.A 24-hour average not to be exceeded.

c.A 1-hour average concentration not to be exceeded more than once every three years on the average.

d.A 4-day average concentration not to be exceeded more than once every three years on the average.

e.Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are compared with the Dieldrin criteria.

f.Shall not exceed the numerical value given by:

$$0.52 \div (FT)(FPH)(2)$$

where: $FT = 10^{[0.03(20-TCAP)]}$; $TCAP \le T \le 30$

$FT = 10^{[0.03(20-T)]}$; $0 \le T \le TCAP$

$FPH = 1$; $8 \le pH \le 9$

$FPH = (1+ 10^{(7.4-pH)}) \div 1.25$; $6.5 \le pH \le 8.0$

$TCAP =$ 20°C; Salmonids present.

$TCAP =$ 25°C; Salmonids absent.

g.Shall not exceed the numerical value given by:

$$0.80 \div (FT)(FPH)(RATIO)$$

where: $RATIO = 13.5$; $7.7 \le pH \le 9$

$RATIO =$

$(20.25 \times 10^{(7.7-pH)}) \div (1+ 10^{(7.4-pH)})$; $6.5 \le pH \le 7.7$

where:FT and FPH are as shown in (f) above except:

TCAP= 15°C; Salmonids present.

TCAP= 20°C; Salmonids absent.

h.Measured in milligrams per liter rather than micrograms per liter.

i.$\le (0.944)(e(1.128[In(hardness)]-3.828))$ at hardness= 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.136672 - [(In hardness)(0.041838)].

j.$\le (0.909)(e(0.7852[In(hardness)]-3.490))$ at hardness= 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.101672 - [(In hardness)(0.041838)].

k.Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.

l.Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.

m.$\le (0.316)e^{(0.8190[\ln(hardness)] +3.688)}$

n.$\le (0.860)e^{(0.8190[\ln(hardness)] +1.561)}$

o.$\le (0.960)(e^{(0.9422[\ln(hardness)] -1.464)})$

p.$\le (0.960)(e^{(0.8545[\ln(hardness)] -1.465)})$

q.$\le (0.791)(e^{(1.273[In(hardness)] -1.460)})$ at hardness= 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.46203 - [(In hardness)(0.145712)].

r.$\le (0.791)(e^{(1.273[In(hardness)] -4.705)})$ at hardness= 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.46203 - [(In hardness)(0.145712)].

s.If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.

t.$\le (0.998)(e^{(0.8460[\ln(hardness)] +3.3612)})$

u.$\le (0.997)(e^{(0.8460[\ln(hardness)] +1.1645)})$

v.$\le e^{[1.005(pH) -5.290]}$

w.$\le e^{[1.005(pH) -4.830]}$

x.The status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 ug/1 in salt water.

y.$\le (0.85)(e^{(1.72[\ln(hardness)] -6.52)})$

z.Channel Catfish may be more acutely sensitive.

aa.$\le (0.978)(e^{(0.8473[\ln(hardness)] +0.8604)})$

bb.$\le (0.986)(e^{(0.8473[\ln(hardness)] +0.7614)})$

cc.Nonlethal effects (growth, C-14 uptake, and chlorophyll production) to diatoms (Thalassiosira aestivalis and Skeletonema costatum) which are common to Washington's waters have been noted at levels below the established criteria. The importance of these effects to the diatom populations and the aquatic system is sufficiently in question to persuade the state to adopt the USEPA National Criteria value (36 µg/L) as the state threshold criteria, however, wherever practical the ambient concentrations should not be allowed to exceed a chronic marine concentration of 21 µg/L.

dd.These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropri-

ate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate.

ee.The criteria for cyanide is based on the weak and dissociable method in the 17th Ed. Standard Methods for the Examination of Water and Wastewater, 4500-CN I, and as revised (see footnote dd, above).

ff.These criteria are based on the total-recoverable fraction of the metal.

gg.Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.

hh.Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water, 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA440/5-88-004, April 1989.

ii.Conversion factor to calculate dissolved metal concentration is 0.982.

jj.Conversion factor to calculate dissolved metal concentration is 0.962.

kk.Conversion factor to calculate dissolved metal concentration is 0.85.

ll.Marine conversion factors (CF) used for calculating dissolved metals concentrations. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. CF for mercury is applicable to the acute criterion only. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion= criterion x CF

Metal	CF
Arsenic	1.000
Cadmium	0.994
Chromium (VI)	0.993
Copper	0.83
Lead	0.951
Mercury	0.85
Nickel	0.990
Selenium	0.998
Silver	0.85
Zinc	0.946

mm.The cyanide criteria are: 9.1µg/l chronic and 2.8µg/l acute and are applicable only to waters which are east of a line from Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson.

(4) USEPA Quality Criteria for Water, 1986 shall be used in the use and interpretation of the values listed in subsection (3) of this section.

(5) Concentrations of toxic, and other substances with toxic propensities not listed in subsection (3) of this section shall be determined in consideration of USEPA Quality Criteria for Water, 1986, and as revised, and other relevant information as appropriate. Human health-based water quality criteria used by the state are contained in 40 CFR 131.36 (known as the National Toxics Rule).

(6) Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than or equal to one in one million.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-040, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-040, filed 11/25/92, effective 12/26/92.]

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

WAC 173-201A-050 Radioactive substances. (1) Deleterious concentrations of radioactive materials for all classes shall be as determined by the lowest practicable concentration attainable and in no case shall exceed:

(a) 1/12.5 of the values listed in WAC 246-221-290 (Column 2, Table II, effluent concentrations, rules and regulations for radiation protection); or

(b) USEPA Drinking Water Regulations for radionuclides, as published in the Federal Register of July 9, 1976, or subsequent revisions thereto.

(2) Nothing in this chapter shall be interpreted to be applicable to those aspects of governmental regulation of radioactive waters which have been preempted from state regulation by the Atomic Energy Act of 1954, as amended, as interpreted by the United States Supreme Court in the cases of *Northern States Power Co. v. Minnesota 405 U.S. 1035 (1972) and Train v. Colorado Public Interest Research Group, 426 U.S. 1 (1976).*

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-050, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-050, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-060 General considerations. The following general guidelines shall apply to the water quality criteria and classifications set forth in WAC 173-201A-030 through 173-201A-140 hereof:

(1) At the boundary between waters of different classifications, the water quality criteria for the higher classification shall prevail.

(2) In brackish waters of estuaries, where the fresh and marine water quality criteria differ within the same classification, the criteria shall be applied on the basis of vertically averaged salinity. The freshwater criteria shall be applied at any point where ninety-five percent of the vertically averaged daily maximum salinity values are less than or equal to one part per thousand. Marine criteria shall apply at all other locations; except that the marine water quality criteria shall apply for dissolved oxygen when the salinity is one part per thousand or greater and for fecal coliform organisms when the salinity is ten parts per thousand or greater.

(3) In determining compliance with the fecal coliform criteria in WAC 173-201A-030, averaging of data collected beyond a thirty-day period, or beyond a specific discharge event under investigation, shall not be permitted when such averaging would skew the data set so as to mask noncompliance periods.

(4)(a) The water quality criteria herein established for total dissolved gas shall not apply when the stream flow exceeds the seven-day, ten-year frequency flood.

(b) The total dissolved gas criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department approved gas abatement plan. This gas abatement plan must be accompanied by fisheries management and physical and biological monitoring plans. The elevated total dissolved gas levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine fish passage. The specific allowances for total dissolved gas exceedances are listed as special conditions for sections of the Snake and Columbia rivers in WAC 173-201A-130 and as shown in the following exemption:

Special fish passage exemption for sections of the Snake and Columbia rivers: When spilling water at dams is necessary to aid fish passage, total dissolved gas must not exceed an average of one hundred fifteen percent as measured at Camas/Washougal below Bonneville dam or as measured in the forebays of the next downstream dams. Total dissolved gas must also not exceed an average of one hundred twenty percent as measured in the tailraces of each dam. These averages are based on the twelve highest hourly readings in any one day of total dissolved gas. In addition, there is a maximum total dissolved gas one hour average of one hundred twenty-five percent, relative to atmospheric pressure, during spillage for fish passage. These special conditions for total dissolved gas in the Snake and Columbia rivers are viewed as temporary and are to be reviewed by the year 2003.

(c) Nothing in these special conditions allows an impact to existing and characteristic uses.

(5) Waste discharge permits, whether issued pursuant to the National Pollutant Discharge Elimination System or otherwise, shall be conditioned so the discharges authorized will meet the water quality standards.

(a) However, persons discharging wastes in compliance with the terms and conditions of permits shall not be subject to civil and criminal penalties on the basis that the discharge violates water quality standards.

(b) Permits shall be subject to modification by the department whenever it appears to the department the discharge violates water quality standards. Modification of permits, as provided herein, shall be subject to review in the same manner as originally issued permits.

(6) No waste discharge permit shall be issued which results in a violation of established water quality criteria, except as provided for under WAC 173-201A-100 or 173-201A-110.

(7) Due consideration will be given to the precision and accuracy of the sampling and analytical methods used as well as existing conditions at the time, in the application of the criteria.

(8) The analytical testing methods for these criteria shall be in accordance with the *"Guidelines Establishing Test Procedures for the Analysis of Pollutants" (40 C.F.R. Part 136)* and other or superseding methods published and/or approved by the department following consultation with adjacent states and concurrence of the USEPA.

(9) Nothing in this chapter shall be interpreted to prohibit the establishment of effluent limitations for the control of the thermal component of any discharge in accordance with Section 316 of the federal Clean Water Act (33 U.S.C. 1251 et seq.).

(10) The primary means for protecting water quality in wetlands is through implementing the antidegradation procedures section (WAC 173-201A-070).

(a) In addition to designated uses, wetlands may have existing beneficial uses that are to be protected that include ground water exchange, shoreline stabilization, and storm water attenuation.

(b) Water quality in wetlands is maintained and protected by maintaining the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses.

(c) Wetlands shall be delineated using the Washington State Wetlands Identification and Delineation Manual, in accordance with WAC 173-22-035.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-060, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-060, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-070 Antidegradation. The antidegradation policy of the state of Washington, as generally guided by chapter 90.48 RCW, Water Pollution Control Act, and chapter 90.54 RCW, Water Resources Act of 1971, is stated as follows:

(1) Existing beneficial uses shall be maintained and protected and no further degradation which would interfere with or become injurious to existing beneficial uses shall be allowed.

(2) Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria.

(3) Water quality shall be maintained and protected in waters designated as outstanding resource waters in WAC 173-201A-080.

(4) Whenever waters are of a higher quality than the criteria assigned for said waters, the existing water quality shall be protected and pollution of said waters which will reduce the existing quality shall not be allowed, except in those instances where:

(a) It is clear, after satisfactory public participation and intergovernmental coordination, that overriding considerations of the public interest will be served;

(b) All wastes and other materials and substances discharged into said waters shall be provided with all known, available, and reasonable methods of prevention, control, and treatment by new and existing point sources before discharge. All activities which result in the pollution of waters from nonpoint sources shall be provided with all known, available, and reasonable best management practices; and

(c) When the lowering of water quality in high quality waters is authorized, the lower water quality shall still be of high enough quality to fully support all existing beneficial uses.

(5) Short-term modification of water quality may be permitted as conditioned by WAC 173-201A-110.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-070, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-080 Outstanding resource waters. Waters meeting one or more of the following criteria shall be considered for outstanding resource water designation. Designations shall be adopted in accordance with the provisions of chapter 34.05 RCW, Administrative Procedure Act.

(1) Waters in national parks, national monuments, national preserves, national wildlife refuges, national wilderness areas, federal wild and scenic rivers, national seashores, national marine sanctuaries, national recreation areas, national scenic areas, and national estuarine research reserves;

(2) Waters in state parks, state natural areas, state wildlife management areas, and state scenic rivers;

(3) Documented aquatic habitat of priority species as determined by the department of wildlife;

(4) Documented critical habitat for populations of threatened or endangered species of native anadromous fish;

(5) Waters of exceptional recreational or ecological significance.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-080, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-100 Mixing zones. (1) The allowable size and location of a mixing zone and the associated effluent limits shall be established in discharge permits, general permits, or orders, as appropriate.

(2) A discharger shall be required to fully apply AKART prior to being authorized a mixing zone.

(3) Mixing zone determinations shall consider critical discharge conditions.

(4) No mixing zone shall be granted unless the supporting information clearly indicates the mixing zone would not have a reasonable potential to cause a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health as determined by the department.

(5) Water quality criteria shall not be violated outside of the boundary of a mixing zone as a result of the discharge for which the mixing zone was authorized.

(6) The size of a mixing zone and the concentrations of pollutants present shall be minimized.

(7) The maximum size of a mixing zone shall comply with the following:

(a) In rivers and streams, mixing zones, singularly or in combination with other mixing zones, shall comply with the most restrictive combination of the following (this size limitation may be applied to estuaries having flow characteristics that resemble rivers):

(i) Not extend in a downstream direction for a distance from the discharge port(s) greater than three hundred feet plus the depth of water over the discharge port(s), or extend upstream for a distance of over one hundred feet;

(ii) Not utilize greater than twenty-five percent of the flow; and

(iii) Not occupy greater than twenty-five percent of the width of the water body.

(b) In estuaries, mixing zones, singularly or in combination with other mixing zones, shall:

(i) Not extend in any horizontal direction from the discharge port(s) for a distance greater than two hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water; and

(ii) Not occupy greater than twenty-five percent of the width of the water body as measured during mean lower low water. For the purpose of this section, areas to the east of a line from Green Point (Fidalgo Island) to Lawrence Point (Orcas Island) are considered estuarine, as are all of the Strait of Georgia and the San Juan Islands north of Orcas Island. To the east of Deception Pass, and to the south and east of Admiralty Head, and south of Point Wilson on the Quimper Peninsula, is Puget Sound proper, which is considered to be entirely estuarine. All waters existing within bays from Point Wilson westward to Cape Flattery and south to the North Jetty of the Columbia River shall also be categorized as estuarine.

(c) In oceanic waters, mixing zones, singularly or in combination with other mixing zones, shall not extend in any horizontal direction from the discharge port(s) for a distance greater than three hundred feet plus the depth of water over the discharge port(s) as measured during mean lower low water. For the purpose of this section, all marine waters not classified as estuarine in (b)(ii) of this subsection shall be categorized as oceanic.

(d) In lakes, and in reservoirs having a mean detention time greater than fifteen days, mixing zones shall not be allowed unless it can be demonstrated to the satisfaction of the department that:

(i) Other siting, technological, and managerial options that would avoid the need for a lake mixing zone are not reasonably achievable;

(ii) Overriding considerations of the public interest will be served; and

(iii) All technological and managerial methods available for pollution reduction and removal that are economically achievable would be implemented prior to discharge. Such methods may include, but not be limited to, advanced waste treatment techniques.

(e) In lakes, and in reservoirs having a mean detention time greater than fifteen days, mixing zones, singularly or in combination with other mixing zones, shall comply with the most restrictive combination of the following:

(i) Not exceed ten percent of the water body volume;

(ii) Not exceed ten percent of the water body surface area (maximum radial extent of the plume regardless of whether it reaches the surface); and

(iii) Not extend beyond fifteen percent of the width of the water body.

(8) Acute criteria are based on numeric criteria and toxicity tests approved by the department, as generally guided under WAC 173-201A-040 (1) through (5), and shall be met as near to the point of discharge as practicably attainable. Compliance shall be determined by monitoring data or calibrated models approved by the department utilizing representative dilution ratios. A zone where acute criteria may be exceeded is allowed only if it can be demonstrated to the department's satisfaction the concentration of, and duration and frequency of exposure to the discharge, will not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem. A zone of acute criteria exceedance shall singularly or in combination with other such zones comply with the following maximum size requirements:

(a) In rivers and streams, a zone where acute criteria may be exceeded shall comply with the most restrictive combination of the following (this size limitation may also be applied to estuaries having flow characteristics resembling rivers):

(i) Not extend beyond ten percent of the distance towards the upstream and downstream boundaries of an authorized mixing zone, as measured independently from the discharge port(s);

(ii) Not utilize greater than two and one-half percent of the flow; and

(iii) Not occupy greater than twenty-five percent of the width of the water body.

(b) In oceanic and estuarine waters a zone where acute criteria may be exceeded shall not extend beyond ten percent of the distance established in subsection (7)(b) of this section as measured independently from the discharge port(s).

(9) Overlap of mixing zones.

(a) Where allowing the overlap of mixing zones would result in a combined area of water quality criteria nonattainment which does not exceed the numeric size limits established under subsection (7) of this section, the overlap may be permitted if:

(i) The separate and combined effects of the discharges can be reasonably determined; and

(ii) The combined effects would not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

(b) Where allowing the overlap of mixing zones would result in exceedance of the numeric size limits established under subsection (7) of this section, the overlap may be allowed only where:

(i) The overlap qualifies for exemption under subsections (12) and (13) of this section; and

(ii) The overlap meets the requirements established in (a) of this subsection.

(10) Storm water:

(a) Storm water discharge from any "point source" containing "process wastewater" as defined in 40 C.F.R. Part 122.2 shall fully conform to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section.

(b) Storm water discharges not described by (a) of this subsection may be granted an exemption to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section, provided the discharger clearly demonstrates to the department's satisfaction that:

(i) All appropriate best management practices established for storm water pollutant control have been applied to the discharge.

(ii) The proposed mixing zone shall not have a reasonable potential to result in a loss of sensitive or important habitat, substantially interfere with the existing or characteristic uses of the water body, result in damage to the ecosystem, or adversely affect public health as determined by the department; and

(iii) The proposed mixing zone shall not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.

(c) All mixing zones for storm water discharges shall be based on a volume of runoff corresponding to a design storm approved by the department. Exceedances from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section due to precipitation events greater than the approved design storm may be allowed by the department, if it would not result in adverse impact to existing or characteristic uses of the water body or result in damage to the ecosystem, or adversely affect public health as determined by the department.

(11) Combined sewer overflows complying with the requirements of chapter 173-245 WAC, may be allowed an average once per year exemption to the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section, provided the discharge complies with subsection (4) of this section.

(12) Exceedances from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section may be considered by the department in the following cases:

(a) For discharges existing prior to November 24, 1992, (or for proposed discharges with engineering plans formally approved by the department prior to November 24, 1992);

(b) Where altering the size configuration is expected to result in greater protection to existing and characteristic uses;

(c) Where the volume of water in the effluent is providing a greater benefit to the existing or characteristic uses of the water body due to flow augmentation than the benefit of removing the discharge, if such removal is the remaining feasible option; or

(d) Where the exceedance is clearly necessary to accommodate important economic or social development in the area in which the waters are located.

(13) Before an exceedance from the numeric size criteria in subsections (7) and (8) of this section and the overlap criteria in subsection (9) of this section may be allowed under subsection (12) of this section, it must clearly be demonstrated to the department's satisfaction that:

(a) AKART appropriate to the discharge is being fully applied;

(b) All siting, technological, and managerial options which would result in full or significantly closer compliance that are economically achievable are being utilized; and

(c) The proposed mixing zone complies with subsection (4) of this section.

(14) Any exemptions granted to the size criteria under subsection (12) of this section shall be reexamined during each permit renewal period for changes in compliance capability. Any significant increase in capability to comply shall be reflected in the renewed discharge permit.

(15) The department may establish permit limits and measures of compliance for human health based criteria (based on lifetime exposure levels), independent of this section.

(16) Sediment impact zones authorized by the department pursuant to chapter 173-204 WAC, Sediment management standards, do not satisfy the requirements of this section.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-100, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-110 Short-term modifications. The criteria and special conditions established in WAC 173-201A-030 through 173-201A-140 may be modified for a specific water body on a short-term basis when necessary to accommodate essential activities, respond to emergencies, or to otherwise protect the public interest, even though such activities may result in a temporary reduction of water quality

conditions below those criteria and classifications established by this regulation. Such activities must be conditioned, timed, and restricted (i.e., hours or days rather than weeks or months) in a manner that will minimize water quality degradation to existing and characteristic uses. In no case will any degradation of water quality be allowed if this degradation significantly interferes with or becomes injurious to characteristic water uses or causes long-term harm to the environment.

(1) A short-term modification may be issued in writing by the director or his/her designee to an individual or entity proposing the aquatic application of pesticides, including but not limited to those used for control of federally or state listed noxious and invasive species, and excess populations of native aquatic plants, mosquitoes, burrowing shrimp, and fish, subject to the following terms and conditions:

(a) A short-term modification will in no way lessen or remove the project proponent's obligations and liabilities under other federal, state and local rules and regulations.

(b) A request for a short-term modification shall be made to the department on forms supplied by the department. Such request shall be made at least thirty days prior to initiation of the proposed activity, and after the project proponent has complied with the requirements of the State Environmental Policy Act (SEPA);

(c) A short-term modification shall be valid for the duration of the activity requiring modification of the criteria and special conditions in WAC 173-201A-030 through 173-201A-140, or for one year, whichever is less. Ecology may authorize a longer duration where the activity is part of an ongoing or long-term operation and maintenance plan, integrated pest or noxious weed management plan, waterbody or watershed management plan, or restoration plan. Such a plan must be developed through a public involvement process consistent with the Administrative Procedure Act (chapter 34.05 RCW) and be in compliance with SEPA, chapter 43.21C RCW, in which case the standards may be modified for the duration of the plan, or for five years, whichever is less;

(d) Appropriate public notice as determined and prescribed by the director or his/her designee shall be given, identifying the pesticide, applicator, location where the pesticide will be applied, proposed timing and method of application, and any water use restrictions specified in USEPA label provisions;

(e) The pesticide application shall be made at times so as to:

(i) Minimize public water use restrictions during weekends; and

(ii) Avoid public water use restrictions during the opening week of fishing season, Memorial Day weekend, Independence Day weekend, and Labor Day weekend;

(f) Any additional conditions as may be prescribed by the director or his/her designee.

(2) A short-term modification may be issued for the control or eradication of noxious weeds identified as such in accordance with the state noxious weed control law, chapter 17.10 RCW, and Control of spartina and purple loosestrife, chapter 17.26 RCW. Short-term modifications for noxious weed control shall be included in a water quality permit issued in accordance with RCW 90.48.445, and the following requirements:

(a) Water quality permits for noxious weed control may be issued to the Washington state department of agriculture (WSDA) for the purposes of coordinating and conducting noxious weed control activities consistent with their responsibilities under chapter 17.10 and 17.26 RCW. Coordination may include noxious weed control activities identified in a WSDA integrated noxious weed management plan and conducted by individual landowners or land managers.

(b) Water quality permits may also be issued to individual landowners or land managers for noxious weed control activities where such activities are not covered by a WSDA integrated noxious weed management plan.

(3) The turbidity criteria established under WAC 173-201A-030 shall be modified to allow a temporary mixing zone during and immediately after necessary in-water or shoreline construction activities that result in the disturbance of in-place sediments. A temporary turbidity mixing zone is subject to the constraints of WAC 173-201A-100 (4) and (6) and is authorized only after the activity has received all other necessary local and state permits and approvals, and after the implementation of appropriate best management practices to avoid or minimize disturbance of in-place sediments and exceedances of the turbidity criteria. A temporary turbidity mixing zone shall be as follows:

(a) For waters up to 10 cfs flow at the time of construction, the point of compliance shall be one hundred feet downstream from activity causing the turbidity exceedance.

(b) For waters above 10 cfs up to 100 cfs flow at the time of construction, the point of compliance shall be two hundred feet downstream of activity causing the turbidity exceedance.

(c) For waters above 100 cfs flow at the time of construction, the point of compliance shall be three hundred feet downstream of activity causing the turbidity exceedance.

(d) For projects working within or along lakes, ponds, wetlands, estuaries, marine waters or other nonflowing waters, the point of compliance shall be at a radius of one hundred fifty feet from activity causing the turbidity exceedance.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-110, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-110, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-120 General classifications. General classifications applying to various surface water bodies not specifically classified under WAC 173-201A-130 or 173-201A-140 are as follows:

(1) All surface waters lying within national parks, national forests, and/or wilderness areas are classified Class AA or Lake Class.

(2) All lakes and their feeder streams within the state are classified Lake Class and Class AA respectively, except for those feeder streams specifically classified otherwise.

(3) All reservoirs with a mean detention time of greater than 15 days are classified Lake Class.

(4) All reservoirs with a mean detention time of 15 days or less are classified the same as the river section in which they are located.

(5) All reservoirs established on preexisting lakes are classified as Lake Class.

(6) All unclassified surface waters that are tributaries to Class AA waters are classified Class AA. All other unclassified surface waters within the state are hereby classified Class A.

[Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-120, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-130 Specific classifications—Freshwater. Specific fresh surface waters of the state of Washington are classified as follows:

(1)	American River.	Class AA
(2)	Big Quilcene River and tributaries.	Class AA
(3)	Bumping River.	Class AA
(4)	Burnt Bridge Creek.	Class A
(5)	Cedar River from Lake Washington to the Maplewood Bridge (river mile 4.1).	Class A
(6)	Cedar River and tributaries from the Maplewood Bridge (river mile 4.1) to Landsburg Dam (river mile 21.6).	Class AA
(7)	Cedar River and tributaries from Landsburg Dam (river mile 21.6) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(8)	Chehalis River from upper boundary of Grays Harbor at Cosmopolis (river mile 3.1, longitude 123°45'45" W) to Scammon Creek (river mile 65.8).	Class A
(9)	Chehalis River from Scammon Creek (river mile 65.8) to Newaukum River (river mile 75.2). Special condition - dissolved oxygen shall exceed 5.0 mg/L from June 1 to September 15. For the remainder of the year, the dissolved oxygen shall meet Class A criteria.	Class A
(10)	Chehalis River from Newaukum River (river mile 75.2) to Rock Creek (river mile 106.7).	Class A
(11)	Chehalis River, from Rock Creek (river mile 106.7) to headwaters.	Class AA
(12)	Chehalis River, south fork.	Class A
(13)	Chewuch River.	Class AA
(14)	Chiwawa River.	Class AA
(15)	Cispus River.	Class AA
(16)	Clearwater River.	Class A
(17)	Cle Elum River.	Class AA
(18)	Cloquallum Creek.	Class A
(19)	Clover Creek from outlet of Lake Spanaway to inlet of Lake Steilacoom.	Class A
(20)	Columbia River from mouth to the Washington-Oregon border (river mile 309.3). Special conditions - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined. Dissolved oxygen shall exceed 90 percent of saturation. Special condition - special fish passage exemption as described in WAC 173-201A-060 (4)(b).	Class A
(21)	Columbia River from Washington-Oregon border (river mile 309.3) to Grand Coulee Dam (river mile 596.6). Special condition from Washington-Oregon border (river mile 309.3) to Priest Rapids Dam (river mile 397.1). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9). Special condition - special fish passage exemption as described in WAC 173-201A-060 (4)(b).	Class A
(22)	Columbia River from Grand Coulee Dam (river mile 596.6) to Canadian border (river mile 745.0).	Class AA
(23)	Colville River.	Class A
(24)	Coweeman River from mouth to Mulholland Creek (river mile 18.4).	Class A
(25)	Coweeman River from Mulholland Creek (river mile 18.4) to headwaters.	Class AA
(26)	Cowlitz River from mouth to base of Riffe Lake Dam (river mile 52.0).	Class A
(27)	Cowlitz River from base of Riffe Lake Dam (river mile 52.0) to headwaters.	Class AA
(28)	Crab Creek and tributaries.	Class B
(29)	Decker Creek.	Class AA
(30)	Deschutes River from mouth to boundary of Snoqualmie National Forest (river mile 48.2).	Class A
(31)	Deschutes River from boundary of Snoqualmie National Forest (river mile 48.2) to headwaters.	Class AA
(32)	Dickey River.	Class A
(33)	Dosewallips River and tributaries.	Class AA
(34)	Duckabush River and tributaries.	Class AA
(35)	Dungeness River from mouth to Canyon Creek (river mile 10.8).	Class A
(36)	Dungeness River and tributaries from Canyon Creek (river mile 10.8) to headwaters.	Class AA
(37)	Duwamish River from mouth south of a line bearing 254° true from the NW corner of berth 3, terminal No. 37 to the Black River (river mile 11.0) (Duwamish River continues as the Green River above the Black River).	Class B
(38)	Elochoman River.	Class A
(39)	Elwha River and tributaries.	Class AA
(40)	Entiat River from Wenatchee National Forest boundary (river mile 20.5) to headwaters.	Class AA
(41)	Grande Ronde River from mouth to Oregon border (river mile 37). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(42)	Grays River from Grays River Falls (river mile 15.8) to headwaters.	Class AA
(43)	Green River (Cowlitz County).	Class AA
(44)	Green River (King County) from Black River (river mile 11.0 and point where Duwamish River continues as the Green River) to west boundary of Sec. 27-T21N-R6E (west boundary of Flaming Geyser State Park at river mile 42.3).	Class A
(45)	Green River (King County) from west boundary of Sec. 27-T21N-R6E (west boundary of Flaming Geyser State Park, river mile 42.3) to west boundary of Sec. 13-T21N-R7E (river mile 59.1).	Class AA

(46)	Green River and tributaries (King County) from west boundary of Sec. 13-T21N-R7E (river mile 59.1) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(47)	Hamma Hamma River and tributaries.	Class AA
(48)	Hanaford Creek from mouth to east boundary of Sec. 25-T15N-R2W (river mile 4.1). Special condition - dissolved oxygen shall exceed 6.5 mg/L.	Class A
(49)	Hanaford Creek from east boundary of Sec. 25-T15N-R2W (river mile 4.1) to headwaters.	Class A
(50)	Hoh River and tributaries.	Class AA
(51)	Hoquiam River (continues as west fork above east fork) from mouth to river mile 9.3 (Dekay Road Bridge) (upper limit of tidal influence).	Class B
(52)	Humptulips River and tributaries from mouth to Olympic National Forest boundary on east fork (river mile 12.8) and west fork (river mile 40.4) (main stem continues as west fork).	Class A
(53)	Humptulips River, east fork from Olympic National Forest boundary (river mile 12.8) to headwaters.	Class AA
(54)	Humptulips River, west fork from Olympic National Forest boundary (river mile 40.4) to headwaters.	Class AA
(55)	Issaquah Creek.	Class A
(56)	Kalama River from lower Kalama River Falls (river mile 10.4) to headwaters.	Class AA
(57)	Klickitat River from Little Klickitat River (river mile 19.8) to boundary of Yakima Indian Reservation.	Class AA
(58)	Lake Washington Ship Canal from Government Locks (river mile 1.0) to Lake Washington (river mile 8.6). Special condition - salinity shall not exceed one part per thousand (1.0 ppt) at any point or depth along a line that transects the ship canal at the University Bridge (river mile 6.1).	Lake Class
(59)	Lewis River, east fork, from Multon Falls (river mile 24.6) to headwaters.	Class AA
(60)	Little Wenatchee River.	Class AA
(61)	Methow River from mouth to Chewuch River (river mile 50.1).	Class A
(62)	Methow River from Chewuch River (river mile 50.1) to headwaters.	Class AA
(63)	Mill Creek from mouth to 13th Street Bridge in Walla Walla (river mile 6.4). Special condition - dissolved oxygen concentration shall exceed 5.0 mg/L.	Class B
(64)	Mill Creek from 13th Street Bridge in Walla Walla (river mile 6.4) to Walla Walla Waterworks Dam (river mile 11.5).	Class A
(65)	Mill Creek and tributaries from city of Walla Walla Waterworks Dam (river mile 21.6) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(66)	Naches River from Snoqualmie National Forest boundary (river mile 35.7) to headwaters.	Class AA
(67)	Naselle River from Naselle "Falls" (cascade at river mile 18.6) to headwaters.	Class AA
(68)	Newaukum River.	Class A
(69)	Nisqually River from mouth to Alder Dam (river mile 44.2).	Class A
(70)	Nisqually River from Alder Dam (river mile 44.2) to headwaters.	Class AA
(71)	Nooksack River from mouth to Maple Creek (river mile 49.7).	Class A
(72)	Nooksack River from Maple Creek (river mile 49.7) to headwaters.	Class AA
(73)	Nooksack River, south fork, from mouth to Skookum Creek (river mile 14.3).	Class A
(74)	Nooksack River, south fork, from Skookum Creek (river mile 14.3) to headwaters.	Class AA
(75)	Nooksack River, middle fork.	Class AA
(76)	Okanogan River.	Class A
(77)	Palouse River from mouth to south fork (Colfax, river mile 89.6).	Class B
(78)	Palouse River from south fork (Colfax, river mile 89.6) to Idaho border (river mile 123.4). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(79)	Pend Oreille River from Canadian border (river mile 16.0) to Idaho border (river mile 87.7). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(80)	Pilchuck River from city of Snohomish Waterworks Dam (river mile 26.8) to headwaters.	Class AA
(81)	Puyallup River from mouth to river mile 1.0.	Class B
(82)	Puyallup River from river mile 1.0 to Kings Creek (river mile 31.6).	Class A
(83)	Puyallup River from Kings Creek (river mile 31.6) to headwaters.	Class AA
(84)	Queets River and tributaries.	Class AA
(85)	Quillayute River.	Class AA
(86)	Quinault River and tributaries.	Class AA
(87)	Salmon Creek (Clark County).	Class A
(88)	Satsop River from mouth to west fork (river mile 6.4).	Class A
(89)	Satsop River, east fork.	Class AA
(90)	Satsop River, middle fork.	Class AA
(91)	Satsop River, west fork.	Class AA
(92)	Skagit River from mouth to Skiyou Slough-lower end (river mile 25.6).	Class A
(93)	Skagit River and tributaries (includes Baker, Suak, Suiattle, and Cascade rivers) from Skiyou Slough-lower end, (river mile 25.6) to Canadian border (river mile 127.0). Special condition - Skagit River (Gorge by-pass reach) from Gorge Dam (river mile 96.6) to Gorge Powerhouse (river mile 94.2). Temperature shall not exceed 21°C due to human activities. When natural conditions exceed 21°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C, nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class AA
(94)	Skokomish River and tributaries.	Class AA
(95)	Skookumchuck River from Bloody Run Creek (river mile 21.4) to headwaters.	Class AA
(96)	Skykomish River from mouth to May Creek (above Gold Bar at river mile 41.2).	Class A
(97)	Skykomish River from May Creek (above Gold Bar at river mile 41.2) to headwaters.	Class AA
(98)	Snake River from mouth to Washington-Idaho-Oregon border (river mile 176.1). Special condition:	

(a)	Below Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9). Special condition - special fish passage exemption as described in WAC 173-201A-060 (4)(b).	
(b)	Above Clearwater River (river mile 139.3). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed 0.3°C due to any single source or 1.1°C due to all such activities combined.	Class A
(99)	Snohomish River from mouth and east of longitude 122°13'40"W upstream to latitude 47°56'30"N (southern tip of Ebey Island at river mile 8.1). Special condition - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL and not have more than 10 percent of the samples obtained for calculating the mean value exceeding 400 colonies/100 mL.	Class A
(100)	Snohomish River upstream from latitude 47°56'30"N (southern tip of Ebey Island river mile 8.1) to confluence with Skykomish and Snoqualmie River (river mile 20.5).	Class A
(101)	Snoqualmie River and tributaries from mouth to west boundary of Twin Falls State Park on south fork (river mile 9.1).	Class A
(102)	Snoqualmie River, middle fork.	Class AA
(103)	Snoqualmie River, north fork.	Class AA
(104)	Snoqualmie River, south fork, from west boundary of Twin Falls State Park (river mile 9.1) to headwaters.	Class AA
(105)	Soleduck River and tributaries.	Class AA
(106)	Spokane River from mouth to Long Lake Dam (river mile 33.9). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(107)	Spokane River from Long Lake Dam (river mile 33.9) to Nine Mile Bridge (river mile 58.0). Special conditions:	
(a)	The average euphotic zone concentration of total phosphorus (as P) shall not exceed 25µg/L during the period of June 1 to October 31.	
(b)	Temperature shall not exceed 20.0°C, due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed t=34/(T+9).	Lake Class
(108)	Spokane River from Nine Mile Bridge (river mile 58.0) to the Idaho border (river mile 96.5). Temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time exceed t=34/(T+9).	Class A
(109)	Stehekin River.	Class AA
(110)	Stillaguamish River from mouth to north and south forks (river mile 17.8).	Class A
(111)	Stillaguamish River, north fork, from mouth to Squire Creek (river mile 31.2).	Class A
(112)	Stillaguamish River, north fork, from Squire Creek (river mile 31.2) to headwaters.	Class AA
(113)	Stillaguamish River, south fork, from mouth to Canyon Creek (river mile 33.7).	Class A
(114)	Stillaguamish River, south fork, from Canyon Creek (river mile 33.7) to headwaters.	Class AA
(115)	Sulphur Creek.	Class B
(116)	Sultan River from mouth to Chaplain Creek (river mile 5.9).	Class A
(117)	Sultan River and tributaries from Chaplain Creek (river mile 5.9) to headwaters. Special condition - no waste discharge will be permitted above city of Everett Diversion Dam (river mile 9.4).	Class AA
(118)	Sumas River from Canadian border (river mile 12) to headwaters (river mile 23).	Class A
(119)	Tieton River.	Class AA
(120)	Tolt River, south fork and tributaries from mouth to west boundary of Sec. 31-T26N-R9E (river mile 6.9).	Class AA
(121)	Tolt River, south fork from west boundary of Sec. 31-T26N-R9E (river mile 6.9) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(122)	Touchet River, north fork from Dayton water intake structure (river mile 3.0) to headwaters.	Class AA
(123)	Toutle River, north fork, from Green River to headwaters.	Class AA
(124)	Toutle River, south fork.	Class AA
(125)	Tucannon River from Umatilla National Forest boundary (river mile 38.1) to headwaters.	Class AA
(126)	Twisp River.	Class AA
(127)	Union River and tributaries from Bremerton Waterworks Dam (river mile 6.9) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(128)	Walla Walla River from mouth to Lowden (Dry Creek at river mile 27.2).	Class B
(129)	Walla Walla River from Lowden (Dry Creek at river mile 27.2) to Oregon border (river mile 40). Special condition - temperature shall not exceed 20.0°C due to human activities. When natural conditions exceed 20.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(130)	Wenatchee River from Wenatchee National Forest boundary (river mile 27.1) to headwaters.	Class AA
(131)	White River (Pierce-King counties) from Mud Mountain Dam (river mile 27.1) to headwaters.	Class AA
(132)	White River (Chelan County).	Class AA
(133)	Wildcat Creek.	Class A
(134)	Willapa River upstream of a line bearing 70° true through Mailboat Slough light (river mile 1.8).	Class A
(135)	Wishkah River from mouth to river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21-T18N-R9W).	Class B
(136)	Wishkah River from river mile 6 (SW 1/4 SW 1/4 NE 1/4 Sec. 21-T18N-R9W) to west fork (river mile 17.7).	Class A
(137)	Wishkah River from west fork of Wishkah River (river mile 17.7) to south boundary of Sec. 33-T21N-R8W (river mile 32.0).	Class AA

(138)	Wishkah River and tributaries from south boundary of Sec. 33-T21N-R8W (river mile 32.0) to headwaters. Special condition - no waste discharge will be permitted.	Class AA
(139)	Wynoochee River from mouth to Olympic National Forest boundary (river mile 45.9).	Class A
(140)	Wynoochee River from Olympic National Forest boundary (river mile 45.9) to headwaters.	Class AA
(141)	Yakima River from mouth to Cle Elum River (river mile 185.6). Special condition - temperature shall not exceed 21.0°C due to human activities. When natural conditions exceed 21.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t=34/(T+9).	Class A
(142)	Yakima River from Cle Elum River (river mile 185.6) to headwaters.	Class AA

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-130, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-130, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-140 Specific classifications—Marine water. Specific marine surface waters of the state of Washington are classified as follows:

(1)	Budd Inlet south of latitude 47°04'N (south of Priest Point Park).	Class B
(2)	Coastal waters: Pacific Ocean from Ilwaco to Cape Flattery.	Class AA
(3)	Commencement Bay south and east of a line bearing 258° true from "Brown's Point" and north and west of line bearing 225° true through the Hylebos waterway light.	Class A
(4)	Commencement Bay, inner, south and east of a line bearing 225° true through Hylebos waterway light except the city waterway south and east of south 11th Street.	Class B
(5)	Commencement Bay, city waterway south and east of south 11th Street.	Class C
(6)	Drayton Harbor, south of entrance.	Class A
(7)	Dyes and Sinclair Inlets west of longitude 122°37'W.	Class A
(8)	Elliott Bay east of a line between Pier 91 and Duwamish head.	Class A
(9)	Everett Harbor, inner, northeast of a line bearing 121° true from approximately 47°59'5"N and 122°13'44"W (southwest corner of the pier).	Class B
(10)	Grays Harbor west of longitude 123°59'W.	Class A
(11)	Grays Harbor east of longitude 123°59'W to longitude 123°45'45"W (Cosmopolis Chehalis River, river mile 3.1). Special condition -dissolved oxygen shall exceed 5.0 mg/L.	Class B
(12)	Guemes Channel, Padilla, Samish and Bellingham Bays east of longitude 122°39'W and north of latitude 48°27'20"N.	Class A
(13)	Hood Canal.	Class AA
(14)	Mukilteo and all North Puget Sound west of longitude 122°39' W (Whidbey, Fidalgo, Guemes and Lummi islands and State Highway 20 Bridge at Deception Pass), except as otherwise noted.	Class AA
(15)	Oakland Bay west of longitude 123°05'W (inner Shelton harbor).	Class B
(16)	Port Angeles south and west of a line bearing 152° true from buoy "2" at the tip of Ediz Hook.	Class A
(17)	Port Gamble south of latitude 47°51'20"N.	Class A
(18)	Port Townsend west of a line between Point Hudson and Kala Point.	Class A
(19)	Possession Sound, south of latitude 47°57'N.	Class AA
(20)	Possession Sound, Port Susan, Saratoga Passage, and Skagit Bay east of Whidbey Island and State Highway 20 Bridge at Deception Pass between latitude 47°57'N (Mukilteo) and latitude 48°27'20"N (Similk Bay), except as otherwise noted.	Class A
(21)	Puget Sound through Admiralty Inlet and South Puget Sound, south and west to longitude 122°52'30"W (Brisco Point) and longitude 122°51'W (northern tip of Hartstene Island).	Class AA
(22)	Sequim Bay southward of entrance.	Class AA
(23)	South Puget Sound west of longitude 122°52'30"W (Brisco Point) and longitude 122°51'W (northern tip of Hartstene Island, except as otherwise noted).	Class A
(24)	Strait of Juan de Fuca.	Class AA
(25)	Totten Inlet and Little Skookum Inlet, west of longitude 122°56'32" (west side of Steamboat Island).	Class AA
(26)	Willapa Bay seaward of a line bearing 70° true through Mailboat Slough light (Willapa River, river mile 1.8).	Class A

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-140, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-140, filed 11/25/92, effective 12/26/92.]

WAC 173-201A-160 Implementation.

(b) For the period of time during which compliance with water quality criteria is deferred, interim effluent limitations shall be formally established, based on the best professional judgment of the department. Interim effluent limitations may be numeric or nonnumeric (e.g., construction of necessary facilities by a specified date as contained in an ecology order or permit).

(c) Prior to establishing a schedule of compliance, the department shall require the discharger to evaluate the possibility of achieving water quality criteria via nonconstruction changes (e.g., facility operation, pollution prevention). Schedules of compliance may in no case exceed ten years, and shall generally not exceed the term of any permit.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-160, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-160, filed 11/25/92, effective 12/26/92.]

(4) **Allowance for compliance schedules.**

(a) Permits, orders, and directives of the department for existing discharges may include a schedule for achieving compliance with water quality criteria contained in this chapter. Such schedules of compliance shall be developed to ensure final compliance with all water quality-based effluent limits in the shortest practicable time. Decisions regarding whether to issue schedules of compliance will be made on a case-by-case basis by the department. Schedules of compliance may not be issued for new discharges. Schedules of compliance may be issued to allow for: (i) construction of necessary treatment capability; (ii) implementation of necessary best management practices; (iii) implementation of additional storm water best management practices for discharges determined not to meet water quality criteria following implementation of an initial set of best management practices; (iv) completion of necessary water quality studies; or (v) resolution of a pending water quality standards' issue through rule-making action.

APPENDIX B

PUBLIC SURVEY - MEMORANDUM - SAMPLE QUESTIONNAIRE

Summary of Questionnaires

As part of the Mid-Puyallup Basin Plan, Pierce County sent out questionnaires to selected residents of the subbasin. To be selected a residence simply had to border a defined water body. Water bodies were defined using the GIS data supplied by the county to Entranco. The purpose of this text is to summarize the results of the returned questionnaires.

The questionnaire surveys were examined and the concerns pertaining to the basin plan were categorized. Seventy-three concerns were deemed to have some significance to the basin planning process. The data was further sorted into four main groupings: Flooding issues, Development concerns, fisheries and wildlife, and water quality problems. The categorization was as follows:

Flooding Issues	34%
Development Concerns	41%
Fisheries and Wildlife	11%
Water Quality Problems	14%

The flooding issues ranged from flooding on the main stem of the Puyallup River to flooding on the smaller tributaries. Some culverts were identified as areas of frequent flooding. Aggradation in the Puyallup River was blamed for recent flooding in several accounts. The levy system on the Puyallup River was mentioned several times as being in need of maintenance and repair. The lack of a formal storm drain system was also called out in several surveys.

Development was the most frequently mentioned problem in the Mid-Puyallup Basin. It should be noted that a large number of the respondents are long time residence of the basin, and that might have contributed to the opinion that development was happening too fast and without consideration for the future. Deforestation related to development was mentioned twice. Erosion was also mention as it relates to the deforestation, specifically on the valley walls. Traffic was called out five times, but is not in the purview of this basin plan. Other complaints related to development dealt with the loss of aquifer recharge areas due to the increase in impervious surface area. By far the strongest opinions were expressed against the operation of the gravel pit near Fennel Creek. It appears that there is a strong coalition of local residents that submitted a typed statement against the location and operation of the gravel mine.

Fisheries and wildlife concerns were centered on salmon. Mention was made of a Historical Native American Village that once was near Alderton. Over fishing and Native American fishing rights were topics brought up by the respondents.

Water quality problems included: unregulated discharges into Bonney Lake, absence of a formal stormwater treatment system, and the continued addition of sediment from the erosion of material near Ball Creek.

May 15, 2001
WP50933

SUBJECT: Mid-Puyallup Basin Plan

Dear Property Owner:
The Pierce County Water Programs Division is currently conducting a study of storm drainage and water resource issues within the Mid-Puyallup Basin. The purpose of the study is to determine whether improvements are needed to ensure that storm drainage facilities function properly and that water quality and habitat are protected. The final product will be a basin plan, which will include a list of potential storm drainage, water quality, and habitat improvement projects. Pierce County hopes to use this information to direct their work efforts in the Mid-Puyallup Basin area.

Within the next few weeks, the Entranco consulting team will conduct a physical survey of water bodies within the basin on behalf of Pierce County. These water bodies include Fennel Creek, Ball Creek, Canyon Falls Creek, Horse Haven Creek and other streams, lakes and wetlands. Field personnel will walk stream channels, examine ponded areas, take measurements, and record the general conditions of the waterbodies.

We request your cooperation in conducting the survey. Survey work will be largely confined to stream channels and other waterbodies, but field personnel may need to enter your property for a short period of time in order to gain access to them. Field personnel will all be qualified engineers, scientists, or technicians under contract with or employed by Entranco, and Water Programs staff. They will try to contact you directly before crossing your property and will carry identification. You are allowed to refuse us access to your property, however, the evaluation could generate projects and policies which would benefit you and your neighbors. All field surveys should be completed by the end of 2001. The consultant expects to begin field surveys in June, and may return to evaluate insect populations within the streams later this fall.

We will be holding a public meeting in the near future to discuss this process and to obtain input from area residents. Notice will be placed in local newspapers. We will also be establishing a mailing list of interested parties. A questionnaire is included with this letter, and we would appreciate your response if you have issues you would like to see considered.

If you would like more information about the survey or object to providing us access, please call our Project Managers at Pierce County Water Programs, Janine Redmond at (253) 798-7569 or Al Zehni, P.E., at (253) 798-4677. With your help, we hope to prepare a plan and strategy which will not only reduce flood and drainage related problems, but also protect resources that add to the quality of life within the basin.

Sincerely,

Janine Redmond
Senior Planner

F:\Projects\D010\MidPuyallup\rightofentry\publicmail.doc

PIERCE COUNTY WATER PROGRAMS
9315 Gravelly lake Drive SW, Suite 200, Lakewood, WA 98499-1502

Mid-Puyallup Basin Plan Questionnaire

Pierce County Water Programs is preparing a surface water management plan for the Mid-Puyallup Basin. The plan will identify the actions necessary to provide safe storm drainage, reduce flooding, maintain water quality and protect natural streams and the fish and wildlife they support. Your completion of this questionnaire will help us make sure that the plan takes account of your views and any information you may have. Please mail completed questionnaires to the address shown below.

If you would like to be on our mailing list please provide the following information:

Name: _____ Email: _____

Organization (if applicable): _____

Address:_____

City, State, Zip: _____ Phone Number: _____

How long have you lived in the Mid-Puyallup Basin? _____

In your opinion, what are the most pressing issues in the Mid-Puyallup Basin?

_____

_____

_____

_____

Please describe any specific flooding and/or erosion problem areas you are aware of:

_____

_____

_____

_____

Are you aware of any locations where water quality is/or seems to be impaired? If so, where?

_____

_____

_____

_____

What prior improvements/policies have benefited the Mid-Puyallup Basin that you are aware of?

_____

_____

_____

_____

Have you observed fish in streams in the Mid-Puyallup Basin area? If so, where and when have you observed them?

_____

_____

_____

_____

If you have observed fish, do you know what species you have seen?

_____

_____

_____

_____

Other Comments:

_____

_____

_____

_____

Thanks for you input!

Please Mail Completed Questionnaire to Al Zehni, P.E. at Pierce County Water Programs
9315 Gravelly Lake Drive SW, Suite 203
Lakewood, WA 98499

APPENDIX C

DETAILS OF PUBLIC MEETINGS

A public meeting held June 26th, 2001 to inform the citizens of the Mid-Puyallup Basin about the upcoming basin planning effort and to illicit input on the locations of flooding, water quality, and habitat problems in the basin. The goals and intentions for the Mid-Puyallup basin plan were presented followed by a period for questions. Below is a summary of the questions asked.

Q. Is the intention of this project to enhance drainage?

A. The goals of the project are to first identify flooding problems within the Mid-Puyallup basin then to recommend possible solutions. Candidates for culvert replacement are an example of this.

Q. What can be done about developments that have already been permitted?

A. If it is already approved the options to prevent building are limited.

Q. What will happen to no-name creek when the gravel pit digs in its source?

A. The County does not believe there is any threat to no-named creek from the gravel pit. If citizens find a problem, they should report it to the County immediately.

Q. Are you going to dredge the Puyallup River?

A. That option is not within the constraints of this project.

Q. Do you have a plan?

A. The intent of this project is to develop a plan.

Q. Have you thought about cleaning the culverts?

A. Yes, that is one of the potential solutions.

Q. How can the water leave the Puyallup River delta when the silts have built up?

A. This question is outside the scope of this project.

Q. What is the County's property buying plan?

A. FEMA provides money to buy flood prone land. The County has participated in this program by purchasing several properties that are known to have repeated flooding.

Q. Why does the County buy land that has never flooded?

A. The County tries to buy tracts of land so there may be parcels within a tract that are outside the flood zone.

Q. What would cause groundwater to rise? (in reference to an article about a road project)

A. The County will look into this.

Q. Don't you have to model the Puyallup to model the little creeks?

A. Only at the interface (confluence). We will use FEMA's data to determine the extent of backwater.

Q. Are you trying to account for aggradation in the Puyallup long term?

A. Although management of the Puyallup River is not the focus of this basin plan, Pierce County is trying to gather this information.

Q. Will rezoning be a product of this study?

A. No, addressing flooding problems is the product.

Q. Will wetland regulations be a result of this study?

A. No, we will not be delineating wetlands.

Q. Our concerns are that your maps will be used to delineate future wetlands.

A. That is not our intention.

Q. Does Fennel Creek have a floodplain? And, has anyone built in it?

A. Some development did occur before FEMA.

Q. What has triggered this study?

A. New stormwater regulations.

Q. Where has the funding come from?

A. The Water Department.

APPENDIX D

IMPERVIOUS SURFACE CALCULATIONS

Existing Land Use Calculations for the Mid-Puyallup Basin

Values acquired from Pierce County GIS data

Subbasin	Land Use Category	AREA (acres)	%TIA	TIA (acres)	% TIA in Subbasin	% EIA	EIA (acres)	% EIA in Subbasin
A-1	Commercial/Service	14.6	83%	12.19		85%	12.44	
A-1	Education	1.3	30%	0.40		30%	0.40	
A-1	High-Density Residential	0.3	44%	0.14		44%	0.14	
A-1	Mobile Home	20.8	23%	4.82		18%	3.74	
A-1	Multi-Family Residential	1.9	50%	0.96		50%	0.96	
A-1	Open Space/Recreation	14.0	7%	1.02		5%	0.70	
A-1	Other	36.8	4%	1.47		0%	0.00	
A-1	Resouce Land (Ag)	238.4	4%	9.49		0%	0.00	
A-1	Single-Family Residential (>1acre lots)	228.3	16%	36.54		11%	25.12	
A-1	Transportation/Communication/Utilities	27.4	46%	12.50		45%	12.35	
A-1	Vacant (Open Space)	180.6	0%	0.00		0%	0.00	
Totals		*764.6*	*3.075*	*79.52*	*10%*	*2.880*	*55.84*	*7%*
BC-1	Commercial/Service	25.9	83%	21.61		85%	22.05	
BC-1	Education	10.0	30%	2.99		30%	2.99	
BC-1	High-Density Residential	29.5	44%	13.04		44%	12.96	
BC-1	Industrial	4.4	67%	2.99		84%	3.73	
BC-1	Mobile Home	18.4	23%	4.27		18%	3.31	
BC-1	Multi-Family Residential	1.5	50%	0.73		50%	0.73	
BC-1	Open Space/Recreation	14.2	7%	1.03		5%	0.71	
BC-1	Other	45.7	4%	1.83		0%	0.00	
BC-1	Public Facilities	0.4	47%	0.17		50%	0.18	
BC-1	Quasi-Public Facilities	1.0	79%	0.77		79%	0.77	
BC-1	Resouce Land (Ag)	173.5	4%	6.90		0%	0.00	
BC-1	Single-Family Residential (>1acre lots)	388.1	16%	62.09		11%	42.69	
BC-1	Transportation/Communication/Utilities	123.8	46%	56.39		45%	55.70	
BC-1	Vacant (Open Space)	211.4	0%	0.00		0%	0.00	
Totals		*1047.7*	*5.004*	*174.83*	*17%*	*5.010*	*145.83*	*14%*
BC-2	Mobile Home	1.4	23%	0.33		18%	0.25	
BC-2	Other	1.2	4%	0.05		0%	0.00	
BC-2	Resouce Land (Ag)	19.2	4%	0.77		0%	0.00	
BC-2	Single-Family Residential (>1acre lots)	25.9	16%	4.15		11%	2.85	
Totals		*47.7*	*0.472*	*5.29*	*11%*	*0.290*	*3.11*	*7%*
BL-1	Education	1.4	30%	0.43		30%	0.43	
BL-1	High-Density Residential	0.2	44%	0.10		44%	0.10	
BL-1	Multi-Family Residential	1.5	50%	0.73		50%	0.74	
BL-1	Other	3.4	4%	0.13		0%	0.00	
BL-1	Quasi-Public Facilities	3.0	79%	2.37		79%	2.37	
BL-1	Single-Family Residential (>1acre lots)	22.0	16%	3.52		11%	2.42	
BL-1	Transportation/Communication/Utilities	0.5	46%	0.21		45%	0.20	

BL-1	Vacant (Open Space)	5.1	0%	0.00		0%	0.00	
Totals		*37.0*	*2.687*	*7.49*	*20%*	*2.590*	*6.25*	*17%*
BL-2	High-Density Residential	2.7	44%	1.20		44%	1.20	
BL-2	Single-Family Residential (>1acre lots)	2.4	16%	0.38		11%	0.26	
BL-2	Transportation/Communication/Utilities	0.6	46%	0.28		45%	0.28	
BL-2	Vacant (Open Space)	1.5	0%	0.00		0%	0.00	
Totals		*7.2*	*1.059*	*1.87*	*26%*	*1.000*	*1.74*	*24%*
BL-3	Commercial/Service	0.4	83%	0.33		85%	0.34	
BL-3	Education	11.6	30%	3.48		30%	3.48	
BL-3	High-Density Residential	0.3	44%	0.13		44%	0.13	
BL-3	Mobile Home	5.6	23%	1.29		18%	1.00	
BL-3	Multi-Family Residential	2.3	50%	1.17		50%	1.17	
BL-3	Open Space/Recreation	1.6	7%	0.12		5%	0.08	
BL-3	Other	27.5	4%	1.10		0%	0.00	
BL-3	Public Facilities	0.3	47%	0.14		50%	0.16	
BL-3	Quasi-Public Facilities	2.9	79%	2.25		79%	2.25	
BL-3	Resouce Land (Ag)	0.3	4%	0.01		0%	0.00	
BL-3	Single-Family Residential (>1acre lots)	207.1	16%	33.13		11%	22.78	
BL-3	Transportation/Communication/Utilities	1.3	46%	0.58		45%	0.58	
BL-3	Vacant (Open Space)	24.7	0%	0.00		0%	0.00	
Totals		*285.7*	*4.331*	*43.74*	*15%*	*4.170*	*31.96*	*11%*
BL-4	Open Space/Recreation	29.8	7%	2.09		5%	1.49	
BL-4	Industrial	0.7	67%	0.50		84%	0.63	
BL-4	Mobile Home	46.7	23%	10.84		18%	8.41	
BL-4	Multi-Family Residential	4.1	50%	2.05		50%	2.05	
BL-4	Open Space/Recreation	21.9	7%	1.59		5%	1.10	
BL-4	Other	4.6	4%	0.18		0%	0.00	
BL-4	Public Facilities	9.8	47%	4.57		50%	4.91	
BL-4	Resouce Land (Ag)	12.2	4%	0.48		0%	0.00	
BL-4	Single-Family Residential (>1acre lots)	258.6	16%	41.38		11%	28.45	
BL-4	Transportation/Communication/Utilities	2.2	46%	1.01		45%	1.00	
BL-4	Vacant (Open Space)	32.2	0%	0.00		0%	0.00	
Totals		*422.9*	*2.707*	*64.70*	*15%*	*2.680*	*48.03*	*11%*
CFC-1	Vacant (Open Space)	528.0	0%	0.00		0%	0.00	
CFC-1	Mobile Home	11.8	23%	2.73		18%	2.12	
CFC-1	Other	0.8	4%	0.03		0%	0.00	
CFC-1	Vacant (Open Space)	269.4	0%	0.00		0%	0.00	
CFC-1	Single-Family Residential (>1acre lots)	86.6	16%	13.86		11%	9.53	
CFC-1	Vacant (Open Space)	227.0	0%	0.00		0%	0.00	
Totals		*1123.7*	*0.432*	*16.63*	*1%*	*0.290*	*11.65*	*1%*
CFC-2	Vacant (Open Space)	804.8	0%	0.00		0%	0.00	
CFC-2	Mobile Home	6.6	23%	1.53		18%	1.19	
CFC-2	Resouce Land (Ag)	0.7	4%	0.03		0%	0.00	
CFC-2	Single-Family Residential (>1acre lots)	25.4	16%	4.06		11%	2.79	

CFC-2	Vacant (Open Space)	83.6	0%	0.00		0%	0.00	
Totals		*921.1*	*0.432*	*5.62*	*1%*	*0.290*	*3.98*	*0%*
CFC-3	Vacant (Open Space)	354.6	0%	0.00		0%	0.00	
CFC-3	Vacant (Open Space)	27.2	0%	0.00		0%	0.00	
Totals		*381.9*	*0.000*	*0.00*	*0%*	*0.000*	*0.00*	*0%*
D-1	High-Density Residential	0.3	44%	0.15		44%	0.15	
D-1	Mobile Home	251.6	23%	58.36		18%	45.28	
D-1	Open Space/Recreation	13.2	7%	0.96		5%	0.66	
D-1	Other	4.0	4%	0.16		0%	0.00	
D-1	Resouce Land (Ag)	78.7	4%	3.13		0%	0.00	
D-1	Single-Family Residential (>1acre lots)	230.4	16%	36.86		11%	25.34	
D-1	Transportation/Communication/Utilities	10.6	46%	4.83		45%	4.77	
D-1	Vacant (Open Space)	220.4	0%	0.00		0%	0.00	
Totals		*809.2*	*1.443*	*104.45*	*13%*	*1.230*	*76.20*	*9%*
D-10	Commercial/Service	21.5	83%	17.94		85%	18.30	
D-10	High-Density Residential	21.3	44%	9.42		44%	9.36	
D-10	Industrial	5.0	67%	3.38		84%	4.22	
D-10	Mobile Home	53.1	23%	12.31		18%	9.55	
D-10	Multi-Family Residential	2.0	50%	1.02		50%	1.02	
D-10	Open Space/Recreation	7.3	7%	0.53		5%	0.37	
D-10	Other	31.3	4%	1.25		0%	0.00	
D-10	Quasi-Public Facilities	0.1	79%	0.11		79%	0.11	
D-10	Resouce Land (Ag)	119.8	4%	4.77		0%	0.00	
D-10	Single-Family Residential (>1acre lots)	130.0	16%	20.79		11%	14.30	
D-10	Transportation/Communication/Utilities	41.3	46%	18.81		45%	18.58	
D-10	Vacant (Open Space)	152.2	0%	0.00		0%	0.00	
Totals		*584.9*	*4.238*	*90.35*	*15%*	*4.210*	*75.81*	*13%*
D-11	High-Density Residential	38.1	44%	16.86		44%	16.75	
D-11	Mobile Home	25.3	23%	5.86		18%	4.55	
D-11	Open Space/Recreation	0.3	7%	0.02		5%	0.02	
D-11	Resouce Land (Ag)	270.2	4%	10.75		0%	0.00	
D-11	Single-Family Residential (>1acre lots)	40.6	16%	6.50		11%	4.47	
D-11	Transportation/Communication/Utilities	0.5	46%	0.24		45%	0.23	
D-11	Vacant (Open Space)	57.0	0%	0.00		0%	0.00	
Totals		*432.1*	*1.403*	*40.24*	*9%*	*1.230*	*26.02*	*6%*
D-12	Commercial/Service	29.2	83%	24.36		85%	24.85	
D-12	Resouce Land (Ag)	112.4	4%	4.50		0%	0.00	
D-12	High-Density Residential	27.0	44%	11.98		44%	11.90	
D-12	Mobile Home	8.8	23%	2.04		18%	1.58	
D-12	Open Space/Recreation	60.1	7%	4.37		5%	3.01	
D-12	Other	23.3	4%	0.93		0%	0.00	
D-12	Resouce Land (Ag)	184.1	4%	7.33		0%	0.00	
D-12	Single-Family Residential (>1acre lots)	90.3	16%	14.44		11%	9.93	
D-12	Transportation/Communication/Utilities	3.8	46%	1.72		45%	1.70	

D-12	Vacant (Open Space)	23.8	0%	0.00		0%	0.00	
Totals		*562.9*	*2.316*	*71.66*	*13%*	*2.080*	*52.96*	*9%*
D-13	Commercial/Service	15.8	83%	13.16		85%	13.42	
D-13	Education	28.8	30%	8.63		30%	8.63	
D-13	Group Home/Other	0.6	26%	0.15		21%	0.12	
D-13	High-Density Residential	18.9	44%	8.37		44%	8.32	
D-13	Industrial	1.2	67%	0.81		84%	1.01	
D-13	Mobile Home	14.9	23%	3.46		18%	2.68	
D-13	Multi-Family Residential	21.7	50%	10.80		50%	10.83	
D-13	Open Space/Recreation	5.2	7%	0.38		5%	0.26	
D-13	Other	7.7	4%	0.31		0%	0.00	
D-13	Public Facilities	1.0	47%	0.45		50%	0.49	
D-13	Quasi-Public Facilities	6.5	79%	5.11		79%	5.11	
D-13	Resouce Land (Ag)	34.4	4%	1.37		0%	0.00	
D-13	Single-Family Residential (>1acre lots)	178.0	16%	28.48		11%	19.58	
D-13	Transportation/Communication/Utilities	5.6	46%	2.57		45%	2.54	
D-13	Vacant (Open Space)	64.1	0%	0.00		0%	0.00	
Totals		*404.3*	*5.265*	*84.05*	*21%*	*5.220*	*73.00*	*18%*
D-14	Commercial/Service	20.4	83%	17.02		85%	17.37	
D-14	Group Home/Other	3.1	26%	0.80		21%	0.64	
D-14	High-Density Residential	2.3	44%	1.02		44%	1.02	
D-14	Industrial	22.3	67%	15.00		84%	18.71	
D-14	Mobile Home	9.8	23%	2.26		18%	1.76	
D-14	Multi-Family Residential	16.7	50%	8.32		50%	8.35	
D-14	Open Space/Recreation	104.2	7%	7.58		5%	5.21	
D-14	Other	18.4	4%	0.74		0%	0.00	
D-14	Resouce Land (Ag)	318.4	4%	12.67		0%	0.00	
D-14	Single-Family Residential (>1acre lots)	75.0	16%	12.00		11%	8.25	
D-14	Transportation/Communication/Utilities	3.2	46%	1.47		45%	1.45	
D-14	Vacant (Open Space)	110.1	0%	0.00		0%	0.00	
Totals		*703.8*	*3.709*	*78.87*	*11%*	*3.630*	*62.74*	*9%*
D-15	Commercial/Service	37.0	83%	30.85		85%	31.47	
D-15	Education	3.3	30%	1.00		30%	1.00	
D-15	High-Density Residential	12.4	44%	5.50		44%	5.47	
D-15	Industrial	9.8	67%	6.57		84%	8.20	
D-15	Mobile Home	5.3	23%	1.23		18%	0.95	
D-15	Multi-Family Residential	14.0	50%	6.97		50%	7.00	
D-15	Other	8.5	4%	0.34		0%	0.00	
D-15	Public Facilities	4.7	47%	2.19		50%	2.36	
D-15	Resouce Land (Ag)	49.1	4%	1.95		0%	0.00	
D-15	Single-Family Residential (>1acre lots)	127.5	16%	20.41		11%	14.03	
D-15	Transportation/Communication/Utilities	14.0	46%	6.36		45%	6.28	
D-15	Vacant (Open Space)	41.4	0%	0.00		0%	0.00	
Totals		*327.0*	*4.140*	*83.37*	*25%*	*4.170*	*76.75*	*23%*

D-16	Commercial/Service	140.0	83%	116.62		85%	118.98	
D-16	Education	9.4	30%	2.83		30%	2.83	
D-16	Group Home/Other	1.4	26%	0.36		21%	0.29	
D-16	High-Density Residential	12.5	44%	5.54		44%	5.50	
D-16	Industrial	12.3	67%	8.28		84%	10.33	
D-16	Mobile Home	7.0	23%	1.62		18%	1.25	
D-16	Multi-Family Residential	60.4	50%	30.08		50%	30.19	
D-16	Open Space/Recreation	5.5	7%	0.40		5%	0.28	
D-16	Other	34.2	4%	1.37		0%	0.00	
D-16	Public Facilities	3.0	47%	1.39		50%	1.50	
D-16	Quasi-Public Facilities	8.3	79%	6.53		79%	6.52	
D-16	Resouce Land (Ag)	1.3	4%	0.05		0%	0.00	
D-16	Single-Family Residential (>1acre lots)	268.3	16%	42.94		11%	29.52	
D-16	Transportation/Communication/Utilities	16.4	46%	7.49		45%	7.39	
D-16	Vacant (Open Space)	56.4	0%	0.00		0%	0.00	
Totals		*636.4*	*5.265*	*225.49*	*35%*	*5.220*	*214.57*	*34%*
D-17	Commercial/Service	42.4	83%	35.30		85%	36.01	
D-17	Education	2.6	30%	0.79		30%	0.79	
D-17	Industrial	55.6	67%	37.46		84%	46.74	
D-17	Mobile Home	20.7	23%	4.81		18%	3.73	
D-17	Multi-Family Residential	7.6	50%	3.80		50%	3.82	
D-17	Open Space/Recreation	5.7	7%	0.42		5%	0.29	
D-17	Other	27.7	4%	1.11		0%	0.00	
D-17	Public Facilities	2.2	47%	1.05		50%	1.12	
D-17	Quasi-Public Facilities	2.0	79%	1.60		79%	1.60	
D-17	Resouce Land (Ag)	473.6	4%	18.85		0%	0.00	
D-17	Single-Family Residential (>1acre lots)	175.5	16%	28.08		11%	19.31	
D-17	Transportation/Communication/Utilities	7.8	46%	3.56		45%	3.52	
D-17	Vacant (Open Space)	212.4	0%	0.00		0%	0.00	
Totals		*1036.0*	*4.561*	*136.83*	*13%*	*4.570*	*116.93*	*11%*
D-18	High-Density Residential	5.2	44%	2.28		44%	2.27	
D-18	Industrial	11.1	67%	7.47		84%	9.33	
D-18	Mobile Home	15.6	23%	3.61		18%	2.80	
D-18	Open Space/Recreation	1.1	7%	0.08		5%	0.05	
D-18	Other	4.5	4%	0.18		0%	0.00	
D-18	Resouce Land (Ag)	44.8	4%	1.78		0%	0.00	
D-18	Single-Family Residential (>1acre lots)	66.9	16%	10.71		11%	7.36	
D-18	Vacant (Open Space)	69.5	0%	0.00		0%	0.00	
Totals		*218.7*	*1.661*	*26.12*	*12%*	*1.620*	*21.81*	*10%*
D-2	High-Density Residential	1.8	44%	0.79		44%	0.78	
D-2	Resouce Land (Ag)	9.0	4%	0.36		0%	0.00	
D-2	Vacant (Open Space)	10.3	0%	0.00		0%	0.00	
Totals		*21.1*	*0.483*	*1.15*	*5%*	*0.440*	*0.78*	*4%*
D-3	High-Density Residential	9.0	44%	3.97		44%	3.94	

D-3	Mobile Home	4.5	23%	1.05		18%	0.82	
D-3	Open Space/Recreation	0.6	7%	0.04		5%	0.03	
D-3	Resouce Land (Ag)	46.5	4%	1.85		0%	0.00	
D-3	Single-Family Residential (>1acre lots)	41.6	16%	6.66		11%	4.58	
D-3	Vacant (Open Space)	117.8	0%	0.00		0%	0.00	
Totals		*220.0*	*0.947*	*13.58*	*6%*	*0.780*	*9.37*	*4%*
D-4	High-Density Residential	15.2	44%	6.73		44%	6.68	
D-4	Industrial	0.1	67%	0.09		84%	0.11	
D-4	Open Space/Recreation	19.2	7%	1.40		5%	0.96	
D-4	Resouce Land (Ag)	474.6	4%	18.89		0%	0.00	
D-4	Single-Family Residential (>1acre lots)	17.7	16%	2.83		11%	1.95	
D-4	Vacant (Open Space)	72.8	0%	0.00		0%	0.00	
Totals		*599.7*	*1.389*	*29.93*	*5%*	*1.440*	*9.70*	*2%*
D-5	High-Density Residential	11.5	44%	5.08		44%	5.04	
D-5	Mobile Home	26.8	23%	6.22		18%	4.83	
D-5	Open Space/Recreation	6.4	7%	0.46		5%	0.32	
D-5	Other	4.7	4%	0.19		0%	0.00	
D-5	Resouce Land (Ag)	29.6	4%	1.18		0%	0.00	
D-5	Single-Family Residential (>1acre lots)	346.1	16%	55.37		11%	38.07	
D-5	Transportation/Communication/Utilities	15.7	46%	7.13		45%	7.05	
D-5	Vacant (Open Space)	277.4	0%	0.00		0%	0.00	
Totals		*718.2*	*1.443*	*75.63*	*11%*	*1.230*	*55.30*	*8%*
D-6	High-Density Residential	38.5	44%	17.05		44%	16.94	
D-6	Mobile Home	47.1	23%	10.92		18%	8.47	
D-6	Other	8.5	4%	0.34		0%	0.00	
D-6	Resouce Land (Ag)	26.0	4%	1.04		0%	0.00	
D-6	Single-Family Residential (>1acre lots)	167.9	16%	26.86		11%	18.47	
D-6	Transportation/Communication/Utilities	4.4	46%	2.02		45%	2.00	
D-6	Vacant (Open Space)	129.9	0%	0.00		0%	0.00	
Totals		*422.3*	*1.370*	*58.23*	*14%*	*1.180*	*45.88*	*11%*
D-7	High-Density Residential	148.6	44%	65.81		44%	65.38	
D-7	Mobile Home	16.3	23%	3.78		18%	2.93	
D-7	Open Space/Recreation	3.1	7%	0.22		5%	0.15	
D-7	Other	62.8	4%	2.51		0%	0.00	
D-7	Public Facilities	0.4	47%	0.16		50%	0.18	
D-7	Resouce Land (Ag)	226.7	4%	9.02		0%	0.00	
D-7	Single-Family Residential (>1acre lots)	119.2	16%	19.07		11%	13.11	
D-7	Transportation/Communication/Utilities	1.5	46%	0.67		45%	0.67	
D-7	Vacant (Open Space)	119.8	0%	0.00		0%	0.00	
Totals		*698.3*	*1.908*	*101.26*	*15%*	*1.730*	*82.42*	*12%*
D-8	Commercial/Service	4.4	83%	3.70		85%	3.78	
D-8	Education	0.2	30%	0.07		30%	0.07	
D-8	High-Density Residential	30.2	44%	13.37		44%	13.28	
D-8	Industrial	9.7	67%	6.52		84%	8.13	

D-8	Mobile Home	15.3	23%	3.56		18%	2.76	
D-8	Multi-Family Residential	5.8	50%	2.91		50%	2.92	
D-8	Open Space/Recreation	271.7	7%	19.76		5%	13.58	
D-8	Other	12.0	4%	0.48		0%	0.00	
D-8	Public Facilities	0.4	47%	0.18		50%	0.19	
D-8	Quasi-Public Facilities	4.6	79%	3.61		79%	3.60	
D-8	Resouce Land (Ag)	573.5	4%	22.83		0%	0.00	
D-8	Single-Family Residential (>1acre lots)	372.3	16%	59.57		11%	40.95	
D-8	Transportation/Communication/Utilities	40.4	46%	18.40		45%	18.17	
D-8	Vacant (Open Space)	231.5	0%	0.00		0%	0.00	
Totals		*1572.1*	*5.004*	*154.96*	*10%*	*5.010*	*107.46*	*7%*
D-9	High-Density Residential	5.0	44%	2.21		44%	2.19	
D-9	Mobile Home	17.4	23%	4.04		18%	3.13	
D-9	Multi-Family Residential	2.9	50%	1.45		50%	1.46	
D-9	Open Space/Recreation	40.4	7%	2.94		5%	2.02	
D-9	Other	9.0	4%	0.36		0%	0.00	
D-9	Resouce Land (Ag)	12.3	4%	0.49		0%	0.00	
D-9	Single-Family Residential (>1acre lots)	225.9	16%	36.14		11%	24.85	
D-9	Transportation/Communication/Utilities	4.3	46%	1.95		45%	1.93	
D-9	Vacant (Open Space)	205.2	0%	0.00		0%	0.00	
Totals		*522.4*	*1.941*	*49.58*	*9%*	*1.730*	*35.58*	*7%*
FC-1	Commercial/Service	35.9	83%	29.91		85%	30.52	
FC-1	Education	19.5	30%	5.84		30%	5.84	
FC-1	High-Density Residential	80.4	44%	35.60		44%	35.37	
FC-1	Industrial	2.1	67%	1.43		84%	1.78	
FC-1	Mobile Home	141.2	23%	32.76		18%	25.42	
FC-1	Multi-Family Residential	9.3	50%	4.63		50%	4.65	
FC-1	Open Space/Recreation	34.4	7%	2.50		5%	1.72	
FC-1	Other	12.5	4%	0.50		0%	0.00	
FC-1	Quasi-Public Facilities	4.3	79%	3.38		79%	3.38	
FC-1	Resouce Land (Ag)	180.9	4%	7.20		0%	0.00	
FC-1	Single-Family Residential (>1acre lots)	417.0	16%	66.72		11%	45.87	
FC-1	Transportation/Communication/Utilities	31.6	46%	14.41		45%	14.24	
FC-1	Vacant (Open Space)	668.2	0%	0.00		0%	0.00	
Totals		*1637.2*	*4.538*	*204.89*	*13%*	*4.510*	*168.77*	*10%*
FC-2	Commercial/Service	4.1	83%	3.45		85%	3.52	
FC-2	Education	1.7	30%	0.50		30%	0.50	
FC-2	Industrial	0.7	67%	0.50		84%	0.63	
FC-2	Mobile Home	8.3	23%	1.93		18%	1.49	
FC-2	Multi-Family Residential	3.4	50%	1.67		50%	1.68	
FC-2	Other	3.2	4%	0.13		0%	0.00	
FC-2	Public Facilities	1.1	47%	0.52		50%	0.56	
FC-2	Quasi-Public Facilities	0.3	79%	0.27		79%	0.27	
FC-2	Resouce Land (Ag)	61.5	4%	2.45		0%	0.00	

FC-2	Single-Family Residential (>1acre lots)	108.9	16%	17.42		11%	11.97	
FC-2	Transportation/Communication/Utilities	1.5	46%	0.70		45%	0.69	
FC-2	Vacant (Open Space)	109.0	0%	0.00		0%	0.00	
Totals		*303.7*	*4.488*	*29.54*	*10%*	*4.520*	*21.32*	*7%*
FC-3	Commercial/Service	32.5	83%	27.05		85%	27.60	
FC-3	High-Density Residential	6.8	44%	3.02		44%	3.00	
FC-3	Industrial	3.5	67%	2.38		84%	2.97	
FC-3	Mobile Home	116.1	23%	26.95		18%	20.91	
FC-3	Multi-Family Residential	5.2	50%	2.61		50%	2.62	
FC-3	Open Space/Recreation	5.7	7%	0.42		5%	0.29	
FC-3	Other	26.1	4%	1.05		0%	0.00	
FC-3	Resouce Land (Ag)	365.3	4%	14.54		0%	0.00	
FC-3	Single-Family Residential (>1acre lots)	358.0	16%	57.29		11%	39.38	
FC-3	Transportation/Communication/Utilities	14.5	46%	6.61		45%	6.53	
FC-3	Vacant (Open Space)	203.0	0%	0.00		0%	0.00	
Totals		*1136.9*	*3.448*	*141.91*	*12%*	*3.420*	*103.30*	*9%*
FC-4	Commercial/Service	61.4	83%	51.18		85%	52.21	
FC-4	Education	20.1	30%	6.03		30%	6.03	
FC-4	High-Density Residential	21.3	44%	9.43		44%	9.37	
FC-4	Industrial	10.4	67%	6.99		84%	8.72	
FC-4	Mobile Home	266.2	23%	61.76		18%	47.92	
FC-4	Multi-Family Residential	8.9	50%	4.45		50%	4.47	
FC-4	Open Space/Recreation	14.2	7%	1.03		5%	0.71	
FC-4	Other	35.0	4%	1.40		0%	0.00	
FC-4	Open Space/Recreation	76.6	7%	5.36		5%	3.83	
FC-4	Quasi-Public Facilities	8.4	79%	6.68		79%	6.67	
FC-4	Resouce Land (Ag)	468.5	4%	18.65		0%	0.00	
FC-4	Single-Family Residential (>1acre lots)	830.5	16%	132.88		11%	91.36	
FC-4	Transportation/Communication/Utilities	11.3	46%	5.17		45%	5.11	
FC-4	Vacant (Open Space)	389.6	0%	0.00		0%	0.00	
Totals		*2222.6*	*4.608*	*311.02*	*14%*	*4.560*	*236.40*	*11%*
FC-5	Commercial/Service	11.8	83%	9.85		85%	10.04	
FC-5	High-Density Residential	43.0	44%	19.03		44%	18.91	
FC-5	Mobile Home	50.2	23%	11.64		18%	9.03	
FC-5	Open Space/Recreation	1.9	7%	0.14		5%	0.09	
FC-5	Other	7.7	4%	0.31		0%	0.00	
FC-5	Quasi-Public Facilities	8.0	79%	6.34		79%	6.33	
FC-5	High-Density Residential	335.6	44%	147.68		44%	147.68	
FC-5	Transportation/Communication/Utilities	3.5	46%	1.61		45%	1.59	
FC-5	Vacant (Open Space)	100.9	0%	0.00		0%	0.00	
Totals		*562.6*	*3.307*	*196.59*	*35%*	*3.200*	*193.68*	*34%*
FC-6	Commercial/Service	17.9	83%	14.88		85%	15.18	
FC-6	Education	29.3	30%	8.78		30%	8.78	
FC-6	High-Density Residential	4.5	44%	1.99		44%	1.98	

FC-6	Mobile Home	8.2	23%	1.90		18%	1.47	
FC-6	Multi-Family Residential	0.8	50%	0.40		50%	0.40	
FC-6	Open Space/Recreation	1.6	7%	0.12		5%	0.08	
FC-6	Other	40.4	4%	1.62		0%	0.00	
FC-6	Quasi-Public Facilities	1.5	79%	1.16		79%	1.16	
FC-6	High-Density Residential	49.8	44%	21.91		44%	21.91	
FC-6	Transportation/Communication/Utilities	4.5	46%	2.05		45%	2.02	
FC-6	Vacant (Open Space)	87.2	0%	0.00		0%	0.00	
Totals		*245.5*	*4.105*	*54.80*	*22%*	*4.000*	*52.98*	*22%*
FC-7	Education	42.0	30%	12.61		30%	12.61	
FC-7	High-Density Residential	9.3	44%	4.11		44%	4.08	
FC-7	High-Density Residential	22.6	44%	9.95		44%	9.95	
FC-7	Single-Family Residential (>1acre lots)	88.2	16%	14.10		11%	9.70	
FC-7	Transportation/Communication/Utilities	2.5	46%	1.15		45%	1.14	
FC-7	Vacant (Open Space)	23.4	0%	0.00		0%	0.00	
Totals		*188.0*	*1.799*	*41.93*	*22%*	*1.740*	*37.48*	*20%*
FC-8	Education	18.1	30%	5.42		30%	5.42	
FC-8	High-Density Residential	59.9	44%	26.53		44%	26.35	
FC-8	High-Density Residential	178.2	44%	78.43		44%	78.43	
FC-8	Multi-Family Residential	6.2	50%	3.10		50%	3.11	
FC-8	Open Space/Recreation	1.5	7%	0.11		5%	0.08	
FC-8	Other	3.7	4%	0.15		0%	0.00	
FC-8	Public Facilities	0.3	47%	0.15		50%	0.16	
FC-8	Quasi-Public Facilities	0.0	79%	0.01		79%	0.01	
FC-8	Resouce Land (Ag)	30.1	4%	1.20		0%	0.00	
FC-8	High-Density Residential	379.3	44%	166.90		44%	166.90	
FC-8	Transportation/Communication/Utilities	11.5	46%	5.24		45%	5.18	
FC-8	Vacant (Open Space)	155.0	0%	0.00		0%	0.00	
Totals		*843.8*	*3.985*	*287.23*	*34%*	*3.910*	*285.63*	*34%*
HH-1	Commercial/Service	2.7	83%	2.26		85%	2.30	
HH-1	High-Density Residential	7.4	44%	3.28		44%	3.26	
HH-1	Mobile Home	5.7	23%	1.33		18%	1.03	
HH-1	Open Space/Recreation	17.4	7%	1.27		5%	0.87	
HH-1	Other	5.0	4%	0.20		0%	0.00	
HH-1	Resouce Land (Ag)	14.3	4%	0.57		0%	0.00	
HH-1	Single-Family Residential (>1acre lots)	124.5	16%	19.92		11%	13.69	
HH-1	Transportation/Communication/Utilities	1.5	46%	0.70		45%	0.69	
HH-1	Vacant (Open Space)	297.4	0%	0.00		0%	0.00	
Totals		*476.0*	*2.276*	*29.52*	*6%*	*2.080*	*21.85*	*5%*
HH-2	Commercial/Service	2.3	83%	1.92		85%	1.96	
HH-2	High-Density Residential	0.4	44%	0.19		44%	0.19	
HH-2	Mobile Home	5.8	23%	1.34		18%	1.04	
HH-2	Open Space/Recreation	1.7	7%	0.12		5%	0.08	
HH-2	Resouce Land (Ag)	107.5	4%	4.28		0%	0.00	

HH-2	Single-Family Residential (2-5 acre lots)	57.0	8%	4.56		3%	1.71	
HH-2	Transportation/Communication/Utilities	0.2	46%	0.10		45%	0.10	
HH-2	Vacant (Open Space)	3.2	0%	0.00		0%	0.00	
Totals		*178.0*	*2.156*	*12.51*	*7%*	*2.000*	*5.08*	*3%*
HH-3	Commercial/Service	6.0	83%	4.98		85%	5.08	
HH-3	Mobile Home	9.4	23%	2.19		18%	1.70	
HH-3	Resouce Land (Ag)	152.3	4%	6.06		0%	0.00	
HH-3	Single-Family Residential (>1acre lots)	12.9	16%	2.06		11%	1.41	
HH-3	Transportation/Communication/Utilities	49.4	46%	22.52		45%	22.25	
HH-3	Vacant (Open Space)	476.5	0%	0.00		0%	0.00	
Totals		*706.6*	*1.721*	*37.82*	*5%*	*1.590*	*30.45*	*4%*
HH-4	Commercial/Service	5.1	83%	4.24		85%	4.33	
HH-4	Industrial	2.9	67%	1.97		84%	2.46	
HH-4	Mobile Home	12.4	23%	2.88		18%	2.23	
HH-4	Other	17.6	4%	0.70		0%	0.00	
HH-4	Public Facilities	28.6	47%	13.33		50%	14.32	
HH-4	Resouce Land (Ag)	313.5	4%	12.48		0%	0.00	
HH-4	Single-Family Residential (>1acre lots)	40.2	16%	6.44		11%	4.42	
HH-4	Transportation/Communication/Utilities	3.5	46%	1.60		45%	1.58	
HH-4	Vacant (Open Space)	13.8	0%	0.00		0%	0.00	
Totals		*437.6*	*2.899*	*43.64*	*10%*	*2.930*	*29.35*	*7%*
HH-5	Commercial/Service	31.9	83%	26.61		85%	27.14	
HH-5	High-Density Residential	28.7	44%	12.73		44%	12.64	
HH-5	Industrial	0.3	67%	0.17		84%	0.21	
HH-5	Mobile Home	135.2	23%	31.37		18%	24.34	
HH-5	Multi-Family Residential	1.1	50%	0.52		50%	0.53	
HH-5	Other	60.1	4%	2.41		0%	0.00	
HH-5	Public Facilities	46.1	47%	21.47		50%	23.06	
HH-5	Resouce Land (Ag)	682.0	4%	27.14		0%	0.00	
HH-5	Single-Family Residential (>1acre lots)	280.3	16%	44.85		11%	30.83	
HH-5	Transportation/Communication/Utilities	18.0	46%	8.20		45%	8.10	
HH-5	Vacant (Open Space)	218.3	0%	0.00		0%	0.00	
Totals		*1502.1*	*3.840*	*175.47*	*12%*	*3.870*	*126.87*	*8%*
HH-6	Commercial/Service	26.7	83%	22.24		85%	22.69	
HH-6	High-Density Residential	38.4	44%	17.03		44%	16.91	
HH-6	Industrial	38.9	67%	26.18		84%	32.67	
HH-6	Mobile Home	37.9	23%	8.80		18%	6.83	
HH-6	Open Space/Recreation	81.0	7%	5.89		5%	4.05	
HH-6	Other	2.2	4%	0.09		0%	0.00	
HH-6	Public Facilities	2.6	47%	1.22		50%	1.31	
HH-6	Resouce Land (Ag)	75.1	4%	2.99		0%	0.00	
HH-6	Single-Family Residential (>1acre lots)	68.8	16%	11.01		11%	7.57	
HH-6	Transportation/Communication/Utilities	439.9	46%	200.40		45%	197.94	
HH-6	Vacant (Open Space)	973.4	0%	0.00		0%	0.00	

Totals		*1785.0*	*3.415*	*295.85*	*17%*	*3.420*	*289.97*	*16%*
HH-7	Commercial/Service	11.7	83%	9.73		85%	9.93	
HH-7	High-Density Residential	20.3	44%	8.97		44%	8.91	
HH-7	Mobile Home	145.9	23%	33.84		18%	26.26	
HH-7	Other	59.2	4%	2.37		0%	0.00	
HH-7	Quasi-Public Facilities	4.7	79%	3.70		79%	3.70	
HH-7	Resouce Land (Ag)	280.4	4%	11.16		0%	0.00	
HH-7	Single-Family Residential (>1acre lots)	457.5	16%	73.21		11%	50.33	
HH-7	Transportation/Communication/Utilities	8.9	46%	4.06		45%	4.01	
HH-7	Vacant (Open Space)	182.6	0%	0.00		0%	0.00	
Totals		*1171.2*	*2.994*	*147.05*	*13%*	*2.820*	*103.14*	*9%*
Main Stem	Commercial/Service	1.4	83%	1.19		85%	1.21	
Main Stem	Industrial	0.3	67%	0.18		84%	0.23	
Main Stem	Mobile Home	3.8	23%	0.87		18%	0.68	
Main Stem	Multi-Family Residential	0.2	50%	0.12		50%	0.12	
Main Stem	Open Space/Recreation	4.3	7%	0.31		5%	0.21	
Main Stem	Other	19.5	4%	0.78		0%	0.00	
Main Stem	Public Facilities	0.2	47%	0.10		50%	0.11	
Main Stem	Resouce Land (Ag)	31.0	4%	1.23		0%	0.00	
Main Stem	Single-Family Residential (>1acre lots)	23.2	16%	3.72		11%	2.56	
Main Stem	Transportation/Communication/Utilities	0.8	46%	0.37		45%	0.36	
Main Stem	Vacant (Open Space)	66.3	0%	0.00		0%	0.00	
Main Stem		16.4						
Totals		*167.3*	*3.470*	*8.88*		*3.480*	*5.48*	
P-1	Commercial/Service	53.6	83%	44.66		85%	45.56	
P-1	Education	46.3	30%	13.89		30%	13.89	
P-1	Group Home/Other	22.5	26%	5.87		21%	4.72	
P-1	Vacant (Open Space)	60.3	0%	0.00		0%	0.00	
P-1	Industrial	114.5	67%	77.10		84%	96.21	
P-1	Mobile Home	20.3	23%	4.71		18%	3.65	
P-1	Multi-Family Residential	34.2	50%	17.04		50%	17.09	
P-1	Open Space/Recreation	93.9	7%	6.83		5%	4.70	
P-1	Other	61.1	4%	2.45		0%	0.00	
P-1	Public Facilities	0.9	47%	0.44		50%	0.47	
P-1	Quasi-Public Facilities	3.1	79%	2.42		79%	2.42	
P-1	Resouce Land (Ag)	18.9	4%	0.75		0%	0.00	
P-1	High-Density Residential	340.6	44%	149.87		44%	149.87	
P-1	Transportation/Communication/Utilities	25.1	46%	11.45		45%	11.31	
P-1	Vacant (Open Space)	331.5	0%	0.00		0%	0.00	
Totals		*1226.9*	*5.102*	*337.47*	*28%*	*5.110*	*349.89*	*29%*
P-2	Commercial/Service	15.2	83%	12.64		85%	12.90	
P-2	Education	41.8	30%	12.53		30%	12.53	
P-2	High-Density Residential	20.1	44%	8.88		44%	8.82	
P-2	Industrial	10.6	67%	7.12		84%	8.89	

P-2	Mobile Home	32.2	23%	7.48		18%	5.80	
P-2	Multi-Family Residential	31.4	50%	15.65		50%	15.71	
P-2	Open Space/Recreation	79.7	7%	5.80		5%	3.99	
P-2	Other	23.2	4%	0.93		0%	0.00	
P-2	Public Facilities	0.8	47%	0.38		50%	0.40	
P-2	Quasi-Public Facilities	6.5	79%	5.10		79%	5.10	
P-2	Resouce Land (Ag)	67.0	4%	2.67		0%	0.00	
P-2	High-Density Residential	1134.7	44%	499.29		44%	499.29	
P-2	Transportation/Communication/Utilities	12.9	46%	5.86		45%	5.79	
P-2	Vacant (Open Space)	308.0	0%	0.00		0%	0.00	
Totals		*1784.0*	*5.284*	*584.33*	*33%*	*5.340*	*579.21*	*32%*
VO-1	Commercial/Service	9.6	83%	8.02		85%	8.18	
VO-1	Education	1.1	30%	0.33		30%	0.33	
VO-1	High-Density Residential	202.7	44%	89.76		44%	89.17	
VO-1	Industrial	4.2	67%	2.83		84%	3.53	
VO-1	Mobile Home	16.3	23%	3.78		18%	2.93	
VO-1	Multi-Family Residential	3.5	50%	1.74		50%	1.74	
VO-1	Open Space/Recreation	56.0	7%	4.07		5%	2.80	
VO-1	Other	21.7	4%	0.87		0%	0.00	
VO-1	Public Facilities	2.7	47%	1.24		50%	1.33	
VO-1	Quasi-Public Facilities	1.2	79%	0.94		79%	0.94	
VO-1	Resouce Land (Ag)	609.0	4%	24.24		0%	0.00	
VO-1	Single-Family Residential (>1acre lots)	244.9	16%	39.19		11%	26.94	
VO-1	Transportation/Communication/Utilities	22.1	46%	10.06		45%	9.94	
VO-1	Vacant (Open Space)	505.1	0%	0.00		0%	0.00	
Totals		*1699.9*	*5.004*	*187.06*	*11%*	*5.010*	*147.84*	*9%*

Future Land Use Calculations for the Mid-Puyallup Basin

Values acquired from GIS data from Pierce County, the City of Sumner, and the City of Bonney Lake.

Subbasin	Zoning Classification	Land-Use Category	AREA (sq meters)	AREA (acres)	TIA (%)	TIA (Acres)	TIA in Subbasin (%)	EIA (%)	EIA (Acres)	EIA in Subbasin (%)
A-1	Agricutural	Agriculture	42358	10.5	4%	0.42		0%	0.00	
A-1	Agricutural	Agriculture	99572	24.6	4%	0.98		0%	0.00	
A-1	Agricutural	Agriculture	249914	61.8	4%	2.46		0%	0.00	
A-1	Employment Center	Commercial	107	0.0	83%	0.02		85%	0.02	
A-1	Employment Center	Commercial	37	0.0	83%	0.01		85%	0.01	
A-1	Low Density Res	Low Density Residential (1-2 acre lot)	1135	0.3	12%	0.03		7%	0.02	
A-1	Master Planned Community	Low Density Residential (<0.25 acre lot)	42656	10.5	35%	3.69		30%	3.16	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	26227	6.5	25%	1.62		20%	1.30	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	429786	106.2	25%	26.55		20%	21.24	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	16	0.0	25%	0.00		20%	0.00	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	51654	12.8	25%	3.19		20%	2.55	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	170089	42.0	25%	10.51		20%	8.41	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	41739	10.3	25%	2.58		20%	2.06	
A-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	14347	3.5	25%	0.89		20%	0.71	
A-1	PDR	Public Places	114121	28.2	47%	13.12		50%	14.10	
A-1	Puyallup	Public Places	120	0.0	47%	0.01		50%	0.01	
A-1	RS-35	Low Density Residential (1-2 acre lot)	68831	17.0	12%	2.04		7%	1.19	
A-1	RS-35	Low Density Residential (1-2 acre lot)	408784	101.0	12%	12.12		7%	7.07	
A-1	RS-35	Low Density Residential (1-2 acre lot)	45840	11.3	12%	1.36		7%	0.79	
A-1	RS-35	Low Density Residential (1-2 acre lot)	52565	13.0	12%	1.56		7%	0.91	
A-1	Rural Five	Low Density Residential (5-10 acre lot)	3856	1.0	5%	0.05		2%	0.02	
A-1	Rural Five	Low Density Residential (5-10 acre lot)	2	0.0	5%	0.00		2%	0.00	
A-1	Rural Five	Low Density Residential (5-10 acre lot)	0	0.0	5%	0.00		2%	0.00	
A-1	Rural Five	Low Density Residential (5-10 acre lot)	1641608	405.6	5%	20.28		2%	8.11	
A-1	Rural Neighborhood Center	Public Places	10763	2.7	47%	1.24		50%	1.33	
A-1	Rural Neighborhood Center	Public Places	30173	7.5	47%	3.47		50%	3.73	
				876.3		108.20	12%		76.75	9%
BC-1	Agricutural	Agriculture	28137	7.0	4%	0.28		0%	0.00	
BC-1	Agricutural	Agriculture	30884	7.6	4%	0.30		0%	0.00	
BC-1	Agricutural	Agriculture	77408	19.1	4%	0.76		0%	0.00	
BC-1	Agricutural	Agriculture	237794	58.8	4%	2.34		0%	0.00	
BC-1	Agricutural	Agriculture	8470	2.1	4%	0.08		0%	0.00	
BC-1	Master Planned Community	Low Density Residential (<0.25 acre lot)	2582	0.6	35%	0.22		30%	0.19	
BC-1	Master Planned Community	Low Density Residential (<0.25 acre lot)	908655	224.5	35%	78.59		30%	67.36	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	2497	0.6	25%	0.15		20%	0.12	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	6551	1.6	25%	0.40		20%	0.32	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1966659	486.0	25%	121.49		20%	97.19	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	12208	3.0	25%	0.75		20%	0.60	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	42916	10.6	25%	2.65		20%	2.12	
BC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	22792	5.6	25%	1.41		20%	1.13	
BC-1	Rural Five	Low Density Residential (5-10 acre lot)	1327931	328.1	5%	16.41		2%	6.56	
				1155.3		225.84	20%		175.60	15%
BC-2	Agricutural	Agriculture	2774	0.7	4%	0.03		0%	0.00	
BC-2	Agricutural	Agriculture	2095	0.5	4%	0.02		0%	0.00	
BC-2	Agricutural	Agriculture	3276	0.8	4%	0.03		0%	0.00	
BC-2	Agricutural	Agriculture	23289	5.8	4%	0.23		0%	0.00	

BC-2	Rural Five	Low Density Residential (5-10 acre lot)	166365	41.1	5%	2.06		2%	0.82	
				48.9		2.36	5%		0.82	2%
BL-1	AUTOMOBILE PARKING.	Roads	41	0.0	46%	0.00		45%	0.00	
BL-1	AUTOMOBILE PARKING.	Roads	148	0.0	46%	0.02		45%	0.02	
BL-1	CHURCHES, SYNAGOGUES ANI	Religious Center	12124	3.0	50%	1.50		50%	1.50	
BL-1	DRAINFIELDS/CATCH BASINS. II	Open Space	25	0.0	7%	0.00		5%	0.00	
BL-1	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	636	0.2	35%	0.05		30%	0.05	
BL-1	EDUCATIONAL SERVICES	College	5743	1.4	37%	0.53		30%	0.43	
BL-1	FOURPLEX (4 FAMILY UNITS).	High Density Residential	2571	0.6	44%	0.28		44%	0.28	
BL-1	GREENBELTS AND COMMON AI	Open Space	1814	0.4	7%	0.03		5%	0.02	
BL-1	LAND THAT FORMERLY HAD DV	Mobile Home	692	0.2	23%	0.04		18%	0.03	
BL-1	LOCAL ACCESS STREETS.	Road	236	0.1	4%	0.00		0%	0.00	
BL-1	LOCAL ACCESS STREETS.	Road	432	0.1	4%	0.00		0%	0.00	
BL-1	LOCAL ACCESS STREETS.	Road	445	0.1	4%	0.00		0%	0.00	
BL-1	Reserve Five	Low Density Residential (5-10 acre lots)	7727	1.9	2%	0.04		0%	0.00	
BL-1	RESIDENTIAL VACANT LAND TH	Open Space	134	0.0	7%	0.00		5%	0.00	
BL-1	ROAD	Road	785	0.2	4%	0.01		0%	0.00	
BL-1	ROAD	Road	1180	0.3	4%	0.01		0%	0.00	
BL-1	ROAD	Road	1314	0.3	4%	0.01		0%	0.00	
BL-1	ROAD	Road	2296	0.6	4%	0.02		0%	0.00	
BL-1	ROAD	Road	7265	1.8	4%	0.07		0%	0.00	
BL-1	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	98115	24.2	35%	8.49		30%	7.27	
BL-1	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	22197	5.5	35%	1.92		30%	1.65	
				41.0		13.04	32%		11.25	27%
BL-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	23476	5.8	25%	1.45		20%	1.16	
BL-2	Reserve Five	Low Density Residential (5-10 acre lots)	5941	1.5	2%	0.03		0%	0.00	
BL-2	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	401	0.1	35%	0.03		30%	0.03	
BL-2	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	1897	0.5	35%	0.16		30%	0.14	
				7.8		1.68	21%		1.33	17%
BL-3	BOAT RENTALS AND BOAT ACC	Commercial	472	0.1	83%	0.10		85%	0.10	
BL-3	BOAT RENTALS AND BOAT ACC	Commercial	1148	0.3	83%	0.24		85%	0.24	
BL-3	CHURCHES, SYNAGOGUES ANI	Religious Center	11542	2.9	50%	1.42		50%	1.43	
BL-3	DRAINFIELDS/CATCH BASINS. II	Open Space	501	0.1	7%	0.01		5%	0.01	
BL-3	DRAINFIELDS/CATCH BASINS. II	Open Space	1749	0.4	7%	0.03		5%	0.02	
BL-3	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	9478	2.3	35%	0.82		30%	0.70	
BL-3	EDUCATIONAL SERVICES	College	34758	8.6	37%	3.20		30%	2.58	
BL-3	ELECTRIC TRANSMISSION RIGI	Open Space	2870	0.7	7%	0.05		5%	0.04	
BL-3	GOVERNMENTAL SERVICES	Public Places	1260	0.3	47%	0.14		50%	0.16	
BL-3	GREENBELTS AND COMMON AI	Open Space	9720	2.4	7%	0.17		5%	0.12	
BL-3	HIGHWAY AND STREET RIGHT-(	Major Roadway	223	0.1	51%	0.03		50%	0.03	
BL-3	LOCAL ACCESS STREETS.	Road	2098	0.5	4%	0.02		0%	0.00	
BL-3	MOBILE HOME(S)	Mobile Home	22464	5.6	23%	1.29		18%	1.00	
BL-3	OTHER WATER AREAS, NOT EL	Water	64928	16.0	0%	0.00		0%	0.00	
BL-3	PARKS - GENERAL RECREATIO	Open Space	6149	1.5	7%	0.11		5%	0.08	
BL-3	PRIMARY (ELEMENTARY) SCHC	Elementary School	2110	0.5	24%	0.13		30%	0.16	
BL-3	PRIMARY (ELEMENTARY) SCHC	Elementary School	10047	2.5	24%	0.61		30%	0.74	
BL-3	REAL PROPERTY NOT USED FC	Open Space	2036	0.5	7%	0.04		5%	0.03	
BL-3	REAL PROPERTY NOT USED FC	Open Space	2140	0.5	7%	0.04		5%	0.03	
BL-3	RESIDENTIAL VACANT LAND TH	Open Space	1104	0.3	7%	0.02		5%	0.01	
BL-3	ROAD	Road	344	0.1	4%	0.00		0%	0.00	
BL-3	ROAD	Road	145305	35.9	4%	1.44		0%	0.00	
BL-3	Rural Five	Low Density Residential (5-10 acre lot)	55	0.0	5%	0.00		2%	0.00	
BL-3	Rural Five	Low Density Residential (5-10 acre lot)	957	0.2	5%	0.01		2%	0.00	

BL-3	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	857579	211.9	35%	74.17		30%	63.57	
BL-3	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	103324	25.5	35%	8.94		30%	7.66	
				319.8		93.00	29%		78.69	25%
BL-4	AGRICULTURE,WITH THE EXCE	Agriculture	40509	10.0	4%	0.40		0%	0.00	
BL-4	DRAINFIELDS/CATCH BASINS. I	Open Space	263	0.1	7%	0.00		5%	0.00	
BL-4	DRAINFIELDS/CATCH BASINS. I	Open Space	1359	0.3	7%	0.02		5%	0.02	
BL-4	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	13147	3.2	35%	1.14		30%	0.97	
BL-4	ELECTRIC TRANSMISSION RIGI	Open Space	4174	1.0	7%	0.07		5%	0.05	
BL-4	EXECUTIVE, LEGISLATIVE AND	Commercial	39779	9.8	83%	8.19		85%	8.35	
BL-4	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	3315	0.8	44%	0.36		44%	0.36	
BL-4	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	3656	0.9	44%	0.40		44%	0.40	
BL-4	GREENBELTS AND COMMON AI	Open Space	7860	1.9	7%	0.14		5%	0.10	
BL-4	MOBILE HOME(S)	Mobile Home	36951	9.1	23%	2.12		18%	1.64	
BL-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	202056	49.9	25%	12.48		20%	9.99	
BL-4	OPEN WATER	Water	43051	10.6	0%	0.00		0%	0.00	
BL-4	PLAYGROUNDS.	Elementary School	75935	18.8	24%	4.57		30%	5.63	
BL-4	REAL PROPERTY NOT USED FC	Open Space	1294	0.3	7%	0.02		5%	0.02	
BL-4	REAL PROPERTY NOT USED FC	Open Space	1604	0.4	7%	0.03		5%	0.02	
BL-4	RESIDENTIAL VACANT LAND TH	Open Space	1186	0.3	7%	0.02		5%	0.01	
BL-4	ROAD	Road	179812	44.4	4%	1.78		0%	0.00	
BL-4	Rural Five	Low Density Residential (5-10 acre lot)	69	0.0	5%	0.00		2%	0.00	
BL-4	Rural Five	Low Density Residential (5-10 acre lot)	139	0.0	5%	0.00		2%	0.00	
BL-4	Rural Five	Low Density Residential (5-10 acre lot)	219287	54.2	5%	2.71		2%	1.08	
BL-4	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	922256	227.9	35%	79.76		30%	68.37	
BL-4	TELEPHONE EXCHANGE STATI	Commercial	1515	0.4	83%	0.31		85%	0.32	
BL-4	VACANT COMMERCIAL LAND.	Commercial	297	0.1	83%	0.06		85%	0.06	
BL-4	VACANT COMMERCIAL LAND.	Commercial	7019	1.7	83%	1.45		85%	1.47	
BL-4	VACANT COMMERCIAL LAND.	Commercial	7063	1.7	83%	1.45		85%	1.48	
BL-4	VACANT LAND - CONSERVATIO	Open Space	1108	0.3	7%	0.02		5%	0.01	
BL-4	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	88905	22.0	35%	7.69		30%	6.59	
BL-4	WETLANDS (RECORDED)	Water	12753	3.2	0%	0.00		0%	0.00	
BL-4	WS	Water	38469	9.5	0%	0.00		0%	0.00	
				483.0		125.20	26%		106.96	22%
CFC-1	Employment Based Planned Comi	Low Density Residential (<0.25 acre lot)	2136937	528.0	35%	184.81		30%	158.41	
CFC-1	Rural Five	Low Density Residential (5-10 acre lot)	2586930	639.2	5%	31.96		2%	12.78	
				1167.3		216.77	19%		171.20	15%
CFC-2	Employment Based Planned Comi	Low Density Residential (<0.25 acre lot)	3274290	809.1	35%	283.18		30%	242.72	
CFC-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1852	0.5	25%	0.11		20%	0.09	
CFC-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	375737	92.8	25%	23.21		20%	18.57	
CFC-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	8417	2.1	25%	0.52		20%	0.42	
CFC-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	2845	0.7	25%	0.18		20%	0.14	
CFC-2	Rural Five	Low Density Residential (5-10 acre lot)	81361	20.1	5%	1.01		2%	0.40	
				925.3		308.20	33%		262.34	28%
CFC-3	Employment Based Planned Comi	Low Density Residential (<0.25 acre lot)	1443901	356.8	35%	124.88		30%	107.04	
CFC-3	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	109579	27.1	25%	6.77		20%	5.42	
				383.9		131.65	34%		112.45	29%
D-1	Agricutural	Agriculture	21480	5.3	4%	0.21		0%	0.00	
D-1	Rural Ten	Low Density Residential (10-20 acre lot)	3302414	816.0	16%	130.56		11%	89.76	
				821.3		130.78	16%		89.76	11%
D-10	Agricutural	Agriculture	179767	44.4	4%	1.77		0%	0.00	
D-10	Agricutural	Agriculture	197524	48.8	4%	1.94		0%	0.00	
D-10	Agricutural	Agriculture	12457	3.1	4%	0.12		0%	0.00	
D-10	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	257373	63.6	25%	15.90		20%	12.72	

D-10	Rural Five	Low Density Residential (5-10 acre lot)	5554	1.4	5%	0.07		2%	0.03	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	675	0.2	5%	0.01		2%	0.00	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	2463	0.6	5%	0.03		2%	0.01	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	1677984	414.6	5%	20.73		2%	8.29	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	6944	1.7	5%	0.09		2%	0.03	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	65	0.0	5%	0.00		2%	0.00	
D-10	Rural Five	Low Density Residential (5-10 acre lot)	177562	43.9	5%	2.19		2%	0.88	
				622.3		42.85	7%		21.97	4%
D-11	Agricutural	Agriculture	6045	1.5	4%	0.06		0%	0.00	
D-11	Agricutural	Agriculture	331861	82.0	4%	3.26		0%	0.00	
D-11	Agricutural	Agriculture	108619	26.8	4%	1.07		0%	0.00	
D-11	Employment Based Planned Comi	Low Density Residential (<0.25 acre lot)	169	0.0	35%	0.01		30%	0.01	
D-11	Employment Based Planned Comi	Low Density Residential (<0.25 acre lot)	133333	32.9	35%	11.53		30%	9.88	
D-11	Rural Five	Low Density Residential (5-10 acre lot)	1241711	306.8	5%	15.34		2%	6.14	
				450.2		31.28	7%		16.03	4%
D-12	Agricutural	Agriculture	443612	109.6	4%	4.36		0%	0.00	
D-12	Agricutural	Agriculture	48168	11.9	4%	0.47		0%	0.00	
D-12	Rural Five	Low Density Residential (5-10 acre lot)	224466	55.5	5%	2.77		2%	1.11	
D-12	Rural Five	Low Density Residential (5-10 acre lot)	8381	2.1	5%	0.10		2%	0.04	
D-12	Rural Five	Low Density Residential (5-10 acre lot)	1676766	414.3	5%	20.72		2%	8.29	
D-12	Rural Neighborhood Center	Public Places	1675	0.4	47%	0.19		50%	0.21	
				593.8		28.62	5%		9.64	2%
D-13	Agricutural	Agriculture	83455	20.6	4%	0.82		0%	0.00	
D-13	Central Business District	Commercial	52940	13.1	83%	10.90		85%	11.12	
D-13	Employment Center	Commercial	12634	3.1	83%	2.60		85%	2.65	
D-13	High Density Residential	High Density Residential	256018	63.3	44%	28.02		44%	27.84	
D-13	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	172806	42.7	30%	12.81		25%	10.68	
D-13	Low Density Residential 6000	Low Density Residential (<0.25 acre lot)	607215	150.0	35%	52.51		30%	45.01	
D-13	Low Density Residential 7200	Low Density Residential (<0.25 acre lot)	176758	43.7	35%	15.29		30%	13.10	
D-13	Low Density Residential 8500	Low Density Residential (<0.25 acre lot)	14767	3.6	35%	1.28		30%	1.09	
D-13	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	48419	12.0	25%	2.99		20%	2.39	
D-13	Open Space	Open Space	7745	1.9	7%	0.13		5%	0.10	
D-13	River	Water	0	0.0	0%	0.00		0%	0.00	
D-13	River	Water	2	0.0	0%	0.00		0%	0.00	
D-13	Road	Road	3266	0.8	4%	0.03		0%	0.00	
D-13	Road	Road	2224	0.5	4%	0.02		0%	0.00	
D-13	Road	Road	459525	113.5	4%	4.54		0%	0.00	
D-13	Rural Five	Low Density Residential (5-10 acre lot)	263733	65.2	5%	3.26		2%	1.30	
				534.1		135.21	25%		115.29	22%
D-14	CB	Commercial	7335	1.8	83%	1.51		85%	1.54	
D-14	CG	Commercial	23929	5.9	83%	4.93		85%	5.03	
D-14	CG	Commercial	27	0.0	83%	0.01		85%	0.01	
D-14	CG	Commercial	57782	14.3	83%	11.90		85%	12.14	
D-14	CG	Commercial	102338	25.3	83%	21.07		85%	21.49	
D-14	Employment Center	Commercial	1230572	304.1	83%	253.35		85%	258.46	
D-14	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	272	0.1	30%	0.02		25%	0.02	
D-14	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	4787	1.2	30%	0.35		25%	0.30	
D-14	ML	Commercial	1	0.0	83%	0.00		85%	0.00	
D-14	ML	Commercial	10346	2.6	83%	2.13		85%	2.17	
D-14	ML	Commercial	3818	0.9	83%	0.79		85%	0.80	
D-14	ML	Commercial	338727	83.7	83%	69.74		85%	71.14	
D-14	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	346055	85.5	25%	21.38		20%	17.10	
D-14	Open Space	Open Space	4	0.0	7%	0.00		5%	0.00	

D-14	Puyallup	Public Places	0	0.0	47%	0.00		50%	0.00	
D-14	RM-20	Multi-Family Residential	773474	191.1	50%	95.24		50%	95.56	
D-14	RS-06	High Density Residential	7090	1.8	44%	0.78		44%	0.77	
D-14	RS-06	High Density Residential	21680	5.4	44%	2.37		44%	2.36	
D-14	Rural Five	Low Density Residential (5-10 acre lot)	1567	0.4	5%	0.02		2%	0.01	
D-14	Rural Five	Low Density Residential (5-10 acre lot)	10212	2.5	5%	0.13		2%	0.05	
D-14	Rural Five	Low Density Residential (5-10 acre lot)	255337	63.1	5%	3.15		2%	1.26	
D-14	Sumner	Public Places	3	0.0	47%	0.00		50%	0.00	
D-14	Sumner	Public Places	16	0.0	47%	0.00		50%	0.00	
D-14	WS	Water	1	0.0	0%	0.00		0%	0.00	
				789.6		488.86	62%		490.21	62%
D-15	CG	Commercial	4121	1.0	83%	0.85		85%	0.87	
D-15	Employment Center	Commercial	94315	23.3	83%	19.42		85%	19.81	
D-15	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	67495	16.7	30%	5.00		25%	4.17	
D-15	Mixed Use District	Quasi Public	194178	48.0	79%	37.93		79%	37.91	
D-15	ML	Commercial	53903	13.3	83%	11.10		85%	11.32	
D-15	ML	Commercial	19762	4.9	83%	4.07		85%	4.15	
D-15	ML	Commercial	24371	6.0	83%	5.02		85%	5.12	
D-15	ML	Commercial	68519	16.9	83%	14.11		85%	14.39	
D-15	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1520735	375.8	25%	93.94		20%	75.15	
D-15	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	0	0.0	25%	0.00		20%	0.00	
D-15	RS-06	High Density Residential	1597	0.4	44%	0.17		44%	0.17	
D-15	Single Family Residential	Low Density Residential (<0.25 acre lot)	0	0.0	35%	0.00		30%	0.00	
D-15	Sumner	Public Places	1	0.0	47%	0.00		50%	0.00	
D-15	Sumner	Public Places	31	0.0	47%	0.00		50%	0.00	
D-15	Sumner	Public Places	3	0.0	47%	0.00		50%	0.00	
D-15	Sumner	Public Places	20	0.0	47%	0.00		50%	0.00	
D-15	Sumner	Public Places	82	0.0	47%	0.01		50%	0.01	
D-15	Urban Neighborhood Center	Public Places	18	0.0	47%	0.00		50%	0.00	
D-15	Urban Neighborhood Center	Public Places	866	0.2	47%	0.10		50%	0.11	
D-15	WS	Water	0	0.0	0%	0.00		0%	0.00	
D-15	WS	Water	39	0.0	0%	0.00		0%	0.00	
				506.6		191.73	38%		173.19	34%
D-16	CBD	Commercial	73384	18.1	83%	15.11		85%	15.41	
D-16	CG	Commercial	881632	217.9	83%	181.51		85%	185.17	
D-16	CG-DTN	Commercial	12953	3.2	83%	2.67		85%	2.72	
D-16	Employment Center	Commercial	5553	1.4	83%	1.14		85%	1.17	
D-16	Low Density Res	Low Density Residential (1-2 acre lot)	1	0.0	12%	0.00		7%	0.00	
D-16	Mixed Use District	Quasi Public	165391	40.9	79%	32.31		79%	32.29	
D-16	ML	Commercial	126002	31.1	83%	25.94		85%	26.46	
D-16	ML-DTN	Commercial	9791	2.4	83%	2.02		85%	2.06	
D-16	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	201626	49.8	25%	12.46		20%	9.96	
D-16	RM-10	High Density Residential	27743	6.9	44%	3.04		44%	3.02	
D-16	RM-20	Multi-Family Residential	184	0.0	50%	0.02		50%	0.02	
D-16	RM-20	Multi-Family Residential	15596	3.9	50%	1.92		50%	1.93	
D-16	RM-20	Multi-Family Residential	1580	0.4	50%	0.19		50%	0.20	
D-16	RM-20	Multi-Family Residential	19601	4.8	50%	2.41		50%	2.42	
D-16	RM-20-DTN	Multi-Family Residential	37187	9.2	50%	4.58		50%	4.59	
D-16	RS-06	High Density Residential	2228	0.6	44%	0.24		44%	0.24	
D-16	RS-06	High Density Residential	562	0.1	44%	0.06		44%	0.06	
D-16	RS-06	High Density Residential	320765	79.3	44%	35.10		44%	34.87	
D-16	RS-06	High Density Residential	853889	211.0	44%	93.45		44%	92.84	
D-16	RS-08	High Density Residential	22534	5.6	44%	2.47		44%	2.45	

D-16	RS-08	High Density Residential	6242	1.5	44%	0.68		44%	0.68	
D-16	RS-08	High Density Residential	2319	0.6	44%	0.25		44%	0.25	
D-16	RS-08	High Density Residential	530049	131.0	44%	58.01		44%	57.63	
D-16	WS	Water	0	0.0	0%	0.00		0%	0.00	
D-16	WS	Water	658	0.2	0%	0.00		0%	0.00	
				819.7		475.59	58%		476.45	58%
D-17	Agriculture	Agriculture	67	0.0	4%	0.00		0%	0.00	
D-17	Agriculture	Agriculture	27	0.0	4%	0.00		0%	0.00	
D-17	Agriculture	Agriculture	134	0.0	4%	0.00		0%	0.00	
D-17	COMMUNITY COMMERCIAL	Commercial	528025	130.5	83%	108.71		85%	110.90	
D-17	Employment Center	Commercial	483227	119.4	83%	99.49		85%	101.49	
D-17	INDUSTRIAL	Industrial	1098842	271.5	67%	182.79		84%	228.08	
D-17	MEDIUM DENSITY RESIDENTIAL	Low Density Residential (<0.25 acre lot)	637775	157.6	35%	55.16		30%	47.28	
D-17	ML	Commercial	769093	190.0	83%	158.34		85%	161.54	
D-17	NEIGHBORHOOD COMMERCIAL	Commercial	65679	16.2	83%	13.52		85%	13.79	
D-17	NEIGHBORHOOD RESIDENTIAL	Multi-Family Residential	647594	160.0	50%	79.74		50%	80.01	
D-17	Puyallup	Public Places	1	0.0	47%	0.00		50%	0.00	
D-17	ROAD	Road	8	0.0	4%	0.00		0%	0.00	
D-17	ROAD	Road	100	0.0	4%	0.00		0%	0.00	
D-17	ROAD	Road	2	0.0	4%	0.00		0%	0.00	
D-17	ROAD	Road	44	0.0	4%	0.00		0%	0.00	
D-17	ROAD	Road	212269	52.5	4%	2.10		0%	0.00	
				1097.8		699.85	64%		743.10	68%
D-18	Agricutural	Agriculture	1370	0.3	4%	0.01		0%	0.00	
D-18	Agricutural	Agriculture	150629	37.2	4%	1.48		0%	0.00	
D-18	Rural Five	Low Density Residential (5-10 acre lot)	312973	77.3	5%	3.87		2%	1.55	
D-18	Rural Five	Low Density Residential (5-10 acre lot)	536751	132.6	5%	6.63		2%	2.65	
				247.5		11.99	5%		4.20	2%
D-2	Rural Ten	Low Density Residential (10-20 acre lot)	102736	25.4	16%	4.06		11%	2.79	
				25.4		4.06	16%		2.79	11%
D-3	Rural Ten	Low Density Residential (10-20 acre lot)	964723	238.4	16%	38.14		11%	26.22	
				238.4		38.14	16%		26.22	11%
D-4	Designated Forest Land	Vacant	1988	0.5	28%	0.14		30%	0.15	
D-4	Designated Forest Land	Vacant	1650	0.4	28%	0.11		30%	0.12	
D-4	Rural Ten	Low Density Residential (10-20 acre lot)	942081	232.8	16%	37.25		11%	25.61	
D-4	Rural Twenty	Low Density Residential (>20 acre lot)	1537897	380.0	35%	133.01		30%	114.00	
				613.7		170.50	28%		139.88	23%
D-5	Agricutural	Agriculture	35169	8.7	4%	0.35		0%	0.00	
D-5	Rural Ten	Low Density Residential (10-20 acre lot)	1236	0.3	16%	0.05		11%	0.03	
D-5	Rural Ten	Low Density Residential (10-20 acre lot)	2972330	734.5	16%	117.51		11%	80.79	
				743.5		117.91	16%		80.82	11%
D-6	Agricutural	Agriculture	68110	16.8	4%	0.67		0%	0.00	
D-6	Rural Ten	Low Density Residential (10-20 acre lot)	90	0.0	16%	0.00		11%	0.00	
D-6	Rural Ten	Low Density Residential (10-20 acre lot)	1679990	415.1	16%	66.42		11%	45.66	
				432.0		67.09	16%		45.67	11%
D-7	Agricutural	Agriculture	11089	2.7	4%	0.11		0%	0.00	
D-7	Agricutural	Agriculture	62812	15.5	4%	0.62		0%	0.00	
D-7	Agricutural	Agriculture	299947	74.1	4%	2.95		0%	0.00	
D-7	Agricutural	Agriculture	203	0.1	4%	0.00		0%	0.00	
D-7	Agricutural	Agriculture	234954	58.1	4%	2.31		0%	0.00	
D-7	Orting	Public Places	660739	163.3	47%	75.99		50%	81.63	
D-7	Rural Five	Low Density Residential (5-10 acre lot)	8039	2.0	5%	0.10		2%	0.04	
D-7	Rural Five	Low Density Residential (5-10 acre lot)	764694	189.0	5%	9.45		2%	3.78	

D-7	Rural Ten	Low Density Residential (10-20 acre lot)	944310	233.3	16%	37.33		11%	25.67	
				738.0		128.86	17%		111.12	15%
D-8	Agricutural	Agriculture	919146	227.1	4%	9.04		0%	0.00	
D-8	Orting	Public Places	3350686	828.0	47%	385.33		50%	413.98	
D-8	Orting	Public Places	8414	2.1	47%	0.97		50%	1.04	
D-8	Rural Five	Low Density Residential (5-10 acre lot)	1340873	331.3	5%	16.57		2%	6.63	
D-8	Rural Ten	Low Density Residential (10-20 acre lot)	9373	2.3	16%	0.37		11%	0.25	
D-8	Rural Ten	Low Density Residential (10-20 acre lot)	957503	236.6	16%	37.86		11%	26.03	
D-8	Rural Ten	Low Density Residential (10-20 acre lot)	367346	90.8	16%	14.52		11%	9.98	
				1718.2		464.65	27%		457.91	27%
D-9	Agricutural	Agriculture	1332	0.3	4%	0.01		0%	0.00	
D-9	Agricutural	Agriculture	1005	0.2	4%	0.01		0%	0.00	
D-9	Master Planned Community	Low Density Residential (<0.25 acre lot)	1163	0.3	35%	0.10		30%	0.09	
D-9	Master Planned Community	Low Density Residential (<0.25 acre lot)	528417	130.6	35%	45.70		30%	39.17	
D-9	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	189319	46.8	25%	11.70		20%	9.36	
D-9	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1375593	339.9	25%	84.98		20%	67.98	
D-9	Rural Five	Low Density Residential (5-10 acre lot)	14383	3.6	5%	0.18		2%	0.07	
D-9	Rural Five	Low Density Residential (5-10 acre lot)	11973	3.0	5%	0.15		2%	0.06	
D-9	Rural Five	Low Density Residential (5-10 acre lot)	177771	43.9	5%	2.20		2%	0.88	
				568.6		145.02	26%		117.60	21%
FC-1	ARTERIAL STREETS.	Roads	1739	0.4	46%	0.20		45%	0.19	
FC-1	AUTOMOBILE REPAIR SERVICE	Commercial	890	0.2	83%	0.18		85%	0.19	
FC-1	BANKING SERVICES.	Commercial	4200	1.0	83%	0.86		85%	0.88	
FC-1	COMMERCIAL LAND WITH RESI	Commercial	712	0.2	83%	0.15		85%	0.15	
FC-1	COMMERICAL LAND WHICH DO	Commercial	441	0.1	83%	0.09		85%	0.09	
FC-1	COMMERICAL LAND WHICH DO	Commercial	3884	1.0	83%	0.80		85%	0.82	
FC-1	Community Center	Public Places	25177	6.2	47%	2.90		50%	3.11	
FC-1	Community Center	Public Places	7761	1.9	47%	0.89		50%	0.96	
FC-1	Community Center	Public Places	38167	9.4	47%	4.39		50%	4.72	
FC-1	COMMUNITY SHOPPING CENTE	Commercial	15990	4.0	83%	3.29		85%	3.36	
FC-1	COMMUNITY SHOPPING CENTE	Commercial	17439	4.3	83%	3.59		85%	3.66	
FC-1	COMMUNITY SHOPPING CENTE	Commercial	33442	8.3	83%	6.89		85%	7.02	
FC-1	CONVENIENCE STORES WITH F	Commercial	2166	0.5	83%	0.45		85%	0.45	
FC-1	DRAINFIELDS/CATCH BASINS.	Open Space	177888	44.0	7%	3.08		5%	2.20	
FC-1	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	13725	3.4	35%	1.19		30%	1.02	
FC-1	EDUCATIONAL SERVICES	College	167	0.0	37%	0.02		30%	0.01	
FC-1	Employment Based Planned Com	Low Density Residential (<0.25 acre lot)	13828	3.4	35%	1.20		30%	1.03	
FC-1	FAST FOOD RESTAURANTS/CAI	Commercial	2440	0.6	83%	0.50		85%	0.51	
FC-1	GENERAL WAREHOUSING AND	Commercial	8593	2.1	83%	1.77		85%	1.80	
FC-1	GREENBELTS AND COMMON AI	Open Space	180	0.0	7%	0.00		5%	0.00	
FC-1	GREENBELTS AND COMMON AI	Open Space	685	0.2	7%	0.01		5%	0.01	
FC-1	GREENBELTS AND COMMON AI	Open Space	2176	0.5	7%	0.04		5%	0.03	
FC-1	GREENBELTS AND COMMON AI	Open Space	2962	0.7	7%	0.05		5%	0.04	
FC-1	GROCERIES (WITH OR WITHOU	Commercial	2914	0.7	83%	0.60		85%	0.61	
FC-1	HIGHWAY AND STREET RIGHT-(	Major Roadway	4869	1.2	51%	0.61		50%	0.60	
FC-1	LAND THAT FORMERLY HAD DV	Mobile Home	780	0.2	23%	0.04		18%	0.03	
FC-1	LAND THAT FORMERLY HAD DV	Mobile Home	1178	0.3	23%	0.07		18%	0.05	
FC-1	LAND THAT FORMERLY HAD DV	Mobile Home	2750	0.7	23%	0.16		18%	0.12	
FC-1	LAND THAT FORMERLY HAD DV	Mobile Home	6151	1.5	23%	0.35		18%	0.27	
FC-1	LOCAL ACCESS STREETS.	Road	6130	1.5	4%	0.06		0%	0.00	
FC-1	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	17313	4.3	79%	3.38		79%	3.38	
FC-1	MINI LUBES SERVICE	Commercial	1334	0.3	83%	0.27		85%	0.28	
FC-1	MISCELLANEOUS RETAIL AND (	Commercial	1968	0.5	83%	0.41		85%	0.41	

FC-1	MISCELLANEOUS RETAIL AND (	Commercial	2776	0.7	83%	0.57		85%	0.58	
FC-1	MOBILE HOME(S)	Mobile Home	130177	32.2	23%	7.46		18%	5.79	
FC-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	2094016	517.4	25%	129.36		20%	103.49	
FC-1	MOTOR VEHICLES (USED CARS	Commercial	2726	0.7	83%	0.56		85%	0.57	
FC-1	OTHER PROFESSIONAL SERVI(	Commercial	2313	0.6	83%	0.48		85%	0.49	
FC-1	OTHER RETAIL TRADE, NOT EL:	Commercial	7053	1.7	83%	1.45		85%	1.48	
FC-1	PARKS - GENERAL RECREATIO	Open Space	56262	13.9	7%	0.97		5%	0.70	
FC-1	REAL PROPERTY NOT USED FC	Open Space	2789	0.7	7%	0.05		5%	0.03	
FC-1	Reserve Five	Low Density Residential (5-10 acre lots)	232905	57.6	2%	1.15		0%	0.00	
FC-1	RESIDENTIAL VACANT LAND TH	Open Space	219	0.1	7%	0.00		5%	0.00	
FC-1	RESIDENTIAL VACANT LAND TH	Open Space	1320	0.3	7%	0.02		5%	0.02	
FC-1	ROAD	Road	259497	64.1	4%	2.56		0%	0.00	
FC-1	Rural Five	Low Density Residential (5-10 acre lot)	2557083	631.9	5%	31.59		2%	12.64	
FC-1	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	602226	148.8	35%	52.08		30%	44.64	
FC-1	TIRES, BATTERIES AND ACCES	Commercial	5017	1.2	83%	1.03		85%	1.05	
FC-1	VACANT COMMERCIAL LAND.	Commercial	21347	5.3	83%	4.39		85%	4.48	
FC-1	VACANT FLOOR AREA.	Open Space	2627	0.6	7%	0.05		5%	0.03	
FC-1	VACANT FLOOR AREA.	Open Space	9321	2.3	7%	0.16		5%	0.12	
FC-1	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	563277	139.2	35%	48.71		30%	41.76	
				1723.0		321.15	19%		255.89	15%
FC-2	Agricutural	Agriculture	100187	24.8	4%	0.99		0%	0.00	
FC-2	AUTOMOBILE PARKING.	Roads	490	0.1	46%	0.06		45%	0.05	
FC-2	COMMERICAL LAND WHICH DO	Commercial	9846	2.4	83%	2.03		85%	2.07	
FC-2	Community Center	Public Places	38447	9.5	47%	4.42		50%	4.75	
FC-2	DANCING SCHOOLS.	Commercial	3052	0.8	83%	0.63		85%	0.64	
FC-2	DANCING SCHOOLS.	Commercial	3736	0.9	83%	0.77		85%	0.78	
FC-2	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	5784	1.4	35%	0.50		30%	0.43	
FC-2	FAST FOOD RESTAURANTS/CA	Commercial	152	0.0	83%	0.03		85%	0.03	
FC-2	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	2078	0.5	44%	0.23		44%	0.23	
FC-2	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	2413	0.6	44%	0.26		44%	0.26	
FC-2	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	2640	0.7	44%	0.29		44%	0.29	
FC-2	FOURPLEX (4 FAMILY UNITS).	High Density Residential	774	0.2	44%	0.08		44%	0.08	
FC-2	FOURPLEX (4 FAMILY UNITS).	High Density Residential	924	0.2	44%	0.10		44%	0.10	
FC-2	FOURPLEX (4 FAMILY UNITS).	High Density Residential	1482	0.4	44%	0.16		44%	0.16	
FC-2	GENERAL WAREHOUSING AND	Commercial	3025	0.7	83%	0.62		85%	0.64	
FC-2	GROCERIES (WITH OR WITHOU	Commercial	2290	0.6	83%	0.47		85%	0.48	
FC-2	HARDWARE.	Commercial	1521	0.4	83%	0.31		85%	0.32	
FC-2	HIGHWAY AND STREET RIGHT-(	Major Roadway	161	0.0	51%	0.02		50%	0.02	
FC-2	INSURANCE CARRIERS.	Commercial	2105	0.5	83%	0.43		85%	0.44	
FC-2	LAND THAT FORMERLY HAD DV	Mobile Home	3654	0.9	23%	0.21		18%	0.16	
FC-2	LAND THAT FORMERLY HAD DV	Mobile Home	4838	1.2	23%	0.28		18%	0.22	
FC-2	LIBRARIES.	Public Places	141	0.0	47%	0.02		50%	0.02	
FC-2	LOCAL ACCESS STREETS.	Road	1681	0.4	4%	0.02		0%	0.00	
FC-2	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	557	0.1	79%	0.11		79%	0.11	
FC-2	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	830	0.2	79%	0.16		79%	0.16	
FC-2	MOBILE HOME(S)	Mobile Home	32711	8.1	23%	1.88		18%	1.45	
FC-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	73364	18.1	25%	4.53		20%	3.63	
FC-2	OTHER RETAIL TRADE, NOT EL:	Commercial	859	0.2	83%	0.18		85%	0.18	
FC-2	POLICE PROTECTION AND REL	Public Places	1678	0.4	47%	0.19		50%	0.21	
FC-2	POSTAL SERVICES.	Public Places	2687	0.7	47%	0.31		50%	0.33	
FC-2	REAL PROPERTY NOT USED FC	Open Space	0	0.0	7%	0.00		5%	0.00	
FC-2	REAL PROPERTY NOT USED FC	Open Space	330	0.1	7%	0.01		5%	0.00	
FC-2	REAL PROPERTY NOT USED FC	Open Space	610	0.2	7%	0.01		5%	0.01	

FC-2	REAL PROPERTY NOT USED FC	Open Space	1359	0.3	7%	0.02		5%	0.02	
FC-2	Reserve Five	Low Density Residential (5-10 acre lots)	561009	138.6	2%	2.77		0%	0.00	
FC-2	RESIDENTIAL VACANT LAND TI	Open Space	187	0.0	7%	0.00		5%	0.00	
FC-2	RESIDENTIAL VACANT LAND TI	Open Space	525	0.1	7%	0.01		5%	0.01	
FC-2	ROAD	Road	1683	0.4	4%	0.02		0%	0.00	
FC-2	ROAD	Road	7734	1.9	4%	0.08		0%	0.00	
FC-2	ROAD	Road	17440	4.3	4%	0.17		0%	0.00	
FC-2	ROAD	Road	65220	16.1	4%	0.64		0%	0.00	
FC-2	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	317453	78.4	35%	27.45		30%	23.53	
FC-2	VACANT COMMERCIAL LAND.	Commercial	884	0.2	83%	0.18		85%	0.19	
FC-2	VACANT COMMERCIAL LAND.	Commercial	2341	0.6	83%	0.48		85%	0.49	
FC-2	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	62632	15.5	35%	5.42		30%	4.64	
FC-2	VETERINARIAN SERVICES.	Commercial	1865	0.5	83%	0.38		85%	0.39	
				332.4		57.94	17%		47.53	14%
FC-3	Agricutural	Agriculture	302666	74.8	4%	2.98		0%	0.00	
FC-3	Agricutural	Agriculture	213360	52.7	4%	2.10		0%	0.00	
FC-3	ARTERIAL STREETS.	Roads	666	0.2	46%	0.07		45%	0.07	
FC-3	BANKING SERVICES.	Commercial	2924	0.7	83%	0.60		85%	0.61	
FC-3	BANKING SERVICES.	Commercial	3016	0.7	83%	0.62		85%	0.63	
FC-3	COFFEE SHOP/CAFE.	Commercial	3219	0.8	83%	0.66		85%	0.68	
FC-3	Community Center	Public Places	96827	23.9	47%	11.14		50%	11.96	
FC-3	CONVENIENT TO NEIGHBORHO	Commercial	714	0.2	83%	0.15		85%	0.15	
FC-3	CONVENIENT TO NEIGHBORHO	Commercial	32993	8.2	83%	6.79		85%	6.93	
FC-3	DRUG AND PROPIETARY.	Commercial	7363	1.8	83%	1.52		85%	1.55	
FC-3	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	1168	0.3	35%	0.10		30%	0.09	
FC-3	FAST FOOD RESTAURANTS/CA	Commercial	944	0.2	83%	0.19		85%	0.20	
FC-3	FAST FOOD RESTAURANTS/CA	Commercial	3224	0.8	83%	0.66		85%	0.68	
FC-3	GROCERIES (WITH OR WITHOU	Commercial	17773	4.4	83%	3.66		85%	3.73	
FC-3	LAND THAT FORMERLY HAD DV	Mobile Home	5512	1.4	23%	0.32		18%	0.25	
FC-3	LOCAL ACCESS STREETS.	Road	571	0.1	4%	0.01		0%	0.00	
FC-3	MISCELLANEOUS RETAIL AND (	Commercial	3385	0.8	83%	0.70		85%	0.71	
FC-3	MISCELLANEOUS RETAIL AND (	Commercial	37074	9.2	83%	7.63		85%	7.79	
FC-3	MOBILE HOME(S)	Mobile Home	239648	59.2	23%	13.74		18%	10.66	
FC-3	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	928806	229.5	25%	57.38		20%	45.90	
FC-3	OTHER PARKS, NOT ELSEWHEI	Open Space	11793	2.9	7%	0.20		5%	0.15	
FC-3	OTHER RETAIL TRADE, AUTOM	Commercial	2947	0.7	83%	0.61		85%	0.62	
FC-3	REAL PROPERTY NOT USED FC	Open Space	14096	3.5	7%	0.24		5%	0.17	
FC-3	Reserve Five	Low Denslty Residential (5-10 acre lots)	451741	111.6	2%	2.23		0%	0.00	
FC-3	Reserve Ten	Low Density Residential (10-20 acre lots)	75805	18.7	16%	3.00		11%	2.06	
FC-3	ROAD	Road	145758	36.0	4%	1.44		0%	0.00	
FC-3	Rural Five	Low Density Residential (5-10 acre lot)	126638	31.3	5%	1.56		2%	0.63	
FC-3	Rural Five	Low Density Residential (5-10 acre lot)	47266	11.7	5%	0.58		2%	0.23	
FC-3	Rural Ten	Low Density Residential (10-20 acre lot)	1242758	307.1	16%	49.13		11%	33.78	
FC-3	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	412017	101.8	35%	35.63		30%	30.54	
FC-3	SMALL MINI-MARTS	Commercial	1758	0.4	83%	0.36		85%	0.37	
FC-3	VACANT COMMERCIAL LAND.	Commercial	34625	8.6	83%	7.13		85%	7.27	
FC-3	VACANT LAND - CONSERVATIO	Open Space	7649	1.9	7%	0.13		5%	0.09	
FC-3	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	465029	114.9	35%	40.22		30%	34.47	
FC-3	VACANT RESIDENTIAL LAND, S	Low Density Residential (<0.25 acre lot)	829	0.2	35%	0.07		30%	0.06	
FC-3	VACANT RESIDENTIAL LAND, S	Low Density Residential (<0.25 acre lot)	852	0.2	35%	0.07		30%	0.06	
FC-3	WELL SITES, RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	3152	0.8	35%	0.27		30%	0.23	
				1222.3		253.91	21%		203.33	17%
FC-4	Agricutural	Agriculture	840192	207.6	4%	8.26		0%	0.00	

FC-4	Community Center	Public Places	987282	244.0	47%	113.54		50%	121.98	
FC-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1877	0.5	25%	0.12		20%	0.09	
FC-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	29923	7.4	25%	1.85		20%	1.48	
FC-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	7689	1.9	25%	0.48		20%	0.38	
FC-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	6755	1.7	25%	0.42		20%	0.33	
FC-4	Reserve Five	Low Density Residential (5-10 acre lots)	667550	165.0	2%	3.30		0%	0.00	
FC-4	Rural Ten	Low Density Residential (10-20 acre lot)	256	0.1	16%	0.01		11%	0.01	
FC-4	Rural Ten	Low Density Residential (10-20 acre lot)	20427	5.0	16%	0.81		11%	0.56	
FC-4	Rural Ten	Low Density Residential (10-20 acre lot)	6932568	1713.0	16%	274.09		11%	188.43	
				2346.1		402.86	17%		313.26	13%
FC-5	Community Center	Public Places	82934	20.5	47%	9.54		50%	10.25	
FC-5	CONVENIENT TO NEIGHBORHO	Commercial	16134	4.0	83%	3.32		85%	3.39	
FC-5	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1019506	251.9	25%	62.98		20%	50.38	
FC-5	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	43	0.0	25%	0.00		20%	0.00	
FC-5	MOTION PICTURE THEATERS.	Commercial	93	0.0	83%	0.02		85%	0.02	
FC-5	REAL PROPERTY NOT USED FC	Open Space	15297	3.8	7%	0.26		5%	0.19	
FC-5	Reserve Five	Low Density Residential (5-10 acre lots)	190865	47.2	2%	0.94		0%	0.00	
FC-5	Rural Ten	Low Density Residential (10-20 acre lot)	796829	196.9	16%	31.50		11%	21.66	
FC-5	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	1524	0.4	35%	0.13		30%	0.11	
FC-5	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	276418	68.3	35%	23.91		30%	20.49	
FC-5	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	120294	29.7	35%	10.40		30%	8.92	
				622.7		143.01	23%		115.41	19%
FC-6	CHURCHES, SYNAGOGUES ANI	Religious Center	5764	1.4	50%	0.71		50%	0.71	
FC-6	CONVENIENT TO NEIGHBORHO	Commercial	18420	4.6	83%	3.79		85%	3.87	
FC-6	DRAINFIELDS/CATCH BASINS. II	Open Space	9937	2.5	7%	0.17		5%	0.12	
FC-6	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	3224	0.8	35%	0.28		30%	0.24	
FC-6	EDUCATIONAL SERVICES	College	49374	12.2	37%	4.54		30%	3.66	
FC-6	EDUCATIONAL SERVICES	College	68998	17.0	37%	6.35		30%	5.11	
FC-6	FAST FOOD RESTAURANTS/CAI	Commercial	1738	0.4	83%	0.36		85%	0.37	
FC-6	GREENBELTS AND COMMON AI	Open Space	761	0.2	7%	0.01		5%	0.01	
FC-6	GREENBELTS AND COMMON AI	Open Space	1387	0.3	7%	0.02		5%	0.02	
FC-6	GREENBELTS AND COMMON AI	Open Space	2200	0.5	7%	0.04		5%	0.03	
FC-6	GROCERIES (WITH OR WITHOU	Commercial	17076	4.2	83%	3.52		85%	3.59	
FC-6	LAND THAT FORMERLY HAD DV	Mobile Home	14601	3.6	23%	0.84		18%	0.65	
FC-6	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	166	0.0	79%	0.03		79%	0.03	
FC-6	MISCELLANEOUS RETAIL AND (	Commercial	25034	6.2	83%	5.15		85%	5.26	
FC-6	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	202007	49.9	25%	12.48		20%	9.98	
FC-6	MOTION PICTURE THEATERS.	Commercial	16930	4.2	83%	3.49		85%	3.56	
FC-6	REAL PROPERTY NOT USED FC	Open Space	158348	39.1	7%	2.74		5%	1.96	
FC-6	ROAD	Road	1743	0.4	4%	0.02		0%	0.00	
FC-6	ROAD	Road	12890	3.2	4%	0.13		0%	0.00	
FC-6	ROAD	Road	19754	4.9	4%	0.20		0%	0.00	
FC-6	ROAD	Road	66197	16.4	4%	0.65		0%	0.00	
FC-6	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	116474	28.8	35%	10.07		30%	8.63	
FC-6	SMALL MINI-MARTS	Commercial	1925	0.5	83%	0.40		85%	0.40	
FC-6	VACANT COMMERCIAL LAND.	Commercial	5537	1.4	83%	1.14		85%	1.16	
FC-6	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	227135	56.1	35%	19.64		30%	16.84	
FC-6	WATER STORAGE. REF. MANUA	Water	3671	0.9	0%	0.00		0%	0.00	
FC-6	WETLANDS (RECORDED)	Water	33986	8.4	0%	0.00		0%	0.00	
				268.2		76.76	29%		66.20	25%
FC-7	EDUCATIONAL SERVICES	College	34864	8.6	37%	3.21		30%	2.58	
FC-7	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	681320	168.4	25%	42.09		20%	33.67	
FC-7	ROAD	Road	23551	5.8	4%	0.23		0%	0.00	

FC-7	Rural Five	Low Density Residential (5-10 acre lot)	275	0.1	5%	0.00		2%	0.00	
FC-7	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	90829	22.4	35%	7.86		30%	6.73	
FC-7	WATER STORAGE. REF. MANU/	Water	6580	1.6	0%	0.00		0%	0.00	
				206.9		53.39	26%		42.99	21%
FC-8	Employment Based Planned Com	Low Density Residential (<0.25 acre lot)	87261	21.6	35%	7.55		30%	6.47	
FC-8	Employment Based Planned Com	Low Density Residential (<0.25 acre lot)	11346	2.8	35%	0.98		30%	0.84	
FC-8	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	942	0.2	25%	0.06		20%	0.05	
FC-8	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	30440	7.5	25%	1.88		20%	1.50	
FC-8	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	3617086	893.8	25%	223.45		20%	178.76	
FC-8	Rural Five	Low Density Residential (5-10 acre lot)	105435	26.1	5%	1.30		2%	0.52	
FC-8	Rural Ten	Low Density Residential (10-20 acre lot)	379	0.1	16%	0.01		11%	0.01	
FC-8	Rural Ten	Low Density Residential (10-20 acre lot)	21908	5.4	16%	0.87		11%	0.60	
				957.5		236.10	25%		188.74	20%
HH-1	Master Planned Community	Low Density Residential (<0.25 acre lot)	1016851	251.3	35%	87.94		30%	75.38	
HH-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	8728	2.2	25%	0.54		20%	0.43	
HH-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	41530	10.3	25%	2.57		20%	2.05	
HH-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	738580	182.5	25%	45.63		20%	36.50	
HH-1	Rural Five	Low Density Residential (5-10 acre lot)	251187	62.1	5%	3.10		2%	1.24	
				508.3		139.78	28%		115.60	23%
HH-2	Agricutural	Agriculture	110982	27.4	4%	1.09		0%	0.00	
HH-2	Agricutural	Agriculture	165560	40.9	4%	1.63		0%	0.00	
HH-2	Rural Five	Low Density Residential (5-10 acre lot)	485031	119.9	5%	5.99		2%	2.40	
				188.2		8.71	5%		2.40	1%
HH-3	Master Planned Community	Low Density Residential (<0.25 acre lot)	153710	38.0	35%	13.29		30%	11.39	
HH-3	Master Planned Community	Low Density Residential (<0.25 acre lot)	207462	51.3	35%	17.94		30%	15.38	
HH-3	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	367087	90.7	25%	22.68		20%	18.14	
HH-3	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1820932	450.0	25%	112.49		20%	89.99	
HH-3	Rural Five	Low Density Residential (5-10 acre lot)	117034	28.9	5%	1.45		2%	0.58	
HH-3	Rural Five	Low Density Residential (5-10 acre lot)	193316	47.8	5%	2.39		2%	0.96	
				706.6		170.24	24%		136.44	19%
HH-4	Agricutural	Agriculture	13940	3.4	4%	0.14		0%	0.00	
HH-4	Agricutural	Agriculture	77801	19.2	4%	0.77		0%	0.00	
HH-4	Agricutural	Agriculture	287652	71.1	4%	2.83		0%	0.00	
HH-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	4468	1.1	25%	0.28		20%	0.22	
HH-4	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	4229	1.0	25%	0.26		20%	0.21	
HH-4	Orting	Public Places	284870	70.4	47%	32.76		50%	35.20	
HH-4	Rural Five	Low Density Residential (5-10 acre lot)	1161722	287.1	5%	14.35		2%	5.74	
				453.3		51.38	11%		41.37	9%
HH-5	Agricutural	Agriculture	190156	47.0	4%	1.87		0%	0.00	
HH-5	Orting	Public Places	300043	74.1	47%	34.51		50%	37.07	
HH-5	Rural Five	Low Density Residential (5-10 acre lot)	23768	5.9	5%	0.29		2%	0.12	
HH-5	Rural Five	Low Density Residential (5-10 acre lot)	81622	20.2	5%	1.01		2%	0.40	
HH-5	Rural Five	Low Density Residential (5-10 acre lot)	1001237	247.4	5%	12.37		2%	4.95	
HH-5	Rural Ten	Low Density Residential (10-20 acre lot)	4646277	1148.1	16%	183.70		11%	126.29	
				1542.7		233.74	15%		168.83	11%
HH-6	Employment Center	Commercial	1741490	430.3	83%	358.54		85%	365.77	
HH-6	Master Planned Community	Low Density Residential (<0.25 acre lot)	3561015	879.9	35%	307.97		30%	263.98	
HH-6	Mixed Use District	Quasi Public	867051	214.2	79%	169.38		79%	169.26	
HH-6	Mixed Use District	Quasi Public	73227	18.1	79%	14.31		79%	14.29	
HH-6	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1145117	283.0	25%	70.74		20%	56.59	
				1825.5		920.95	50%		869.89	48%
HH-7	Agricutural	Agriculture	13822	3.4	4%	0.14		0%	0.00	
HH-7	Agricutural	Agriculture	32439	8.0	4%	0.32		0%	0.00	

HH-7	Master Planned Community	Low Density Residential (<0.25 acre lot)	9574	2.4	35%	0.83		30%	0.71	
HH-7	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	403227	99.6	25%	24.91		20%	19.93	
HH-7	Reserve Ten	Low Density Residential (10-20 acre lots)	348910	86.2	16%	13.79		11%	9.48	
HH-7	Rural Five	Low Density Residential (5-10 acre lot)	307734	76.0	5%	3.80		2%	1.52	
HH-7	Rural Five	Low Density Residential (5-10 acre lot)	1011123	249.8	5%	12.49		2%	5.00	
HH-7	Rural Five	Low Density Residential (5-10 acre lot)	74036	18.3	5%	0.91		2%	0.37	
HH-7	Rural Neighborhood Center	Public Places	66552	16.4	47%	7.65		50%	8.22	
HH-7	Rural Ten	Low Density Residential (10-20 acre lot)	2054797	507.7	16%	81.24		11%	55.85	
HH-7	Rural Ten	Low Density Residential (10-20 acre lot)	587441	145.2	16%	23.23		11%	15.97	
				1213.2		169.31	14%		117.05	10%
P-1	CB	Commercial	11280	2.8	83%	2.32		85%	2.37	
P-1	CG	Commercial	598160	147.8	83%	123.15		85%	125.63	
P-1	CL	Commercial	40792	10.1	83%	8.40		85%	8.57	
P-1	Low Density Res	Low Density Residential (1-2 acre lot)	1	0.0	12%	0.00		7%	0.00	
P-1	Low Density Res	Low Density Residential (1-2 acre lot)	1	0.0	12%	0.00		7%	0.00	
P-1	Mixed Use District	Quasi Public	18278	4.5	79%	3.57		79%	3.57	
P-1	Mixed Use District	Quasi Public	30	0.0	79%	0.01		79%	0.01	
P-1	ML	Commercial	396175	97.9	83%	81.57		85%	83.21	
P-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	280952	69.4	25%	17.36		20%	13.88	
P-1	MP	Commercial	719297	177.7	83%	148.09		85%	151.08	
P-1	OP	Commercial	19631	4.9	83%	4.04		85%	4.12	
P-1	OP	Commercial	3985	1.0	83%	0.82		85%	0.84	
P-1	PDC	Public Places	147933	36.6	47%	17.01		50%	18.28	
P-1	PDR	Public Places	11207	2.8	47%	1.29		50%	1.38	
P-1	RM-10	High Density Residential	264852	65.4	44%	28.99		44%	28.80	
P-1	RM-20	Multi-Family Residential	476214	117.7	50%	58.64		50%	58.84	
P-1	RM-20-MO	Multi-Family Residential	65076	16.1	50%	8.01		50%	8.04	
P-1	RS-04	High Density Residential	101331	25.0	44%	11.09		44%	11.02	
P-1	RS-04	High Density Residential	7845	1.9	44%	0.86		44%	0.85	
P-1	RS-06	High Density Residential	403	0.1	44%	0.04		44%	0.04	
P-1	RS-08	High Density Residential	177206	43.8	44%	19.39		44%	19.27	
P-1	RS-10	Low Density Residential (<0.25 acre lot)	1771704	437.8	35%	153.23		30%	131.34	
P-1	RS-35	Low Density Residential (1-2 acre lot)	65831	16.3	12%	1.95		7%	1.14	
P-1	RS-35	Low Density Residential (1-2 acre lot)	129755	32.1	12%	3.85		7%	2.24	
P-1	RS-35	Low Density Residential (1-2 acre lot)	340583	84.2	12%	10.10		7%	5.89	
				1395.8		703.77	50%		680.40	49%
P-2	CB	Commercial	50496	12.5	83%	10.40		85%	10.61	
P-2	CB	Commercial	94878	23.4	83%	19.53		85%	19.93	
P-2	CG	Commercial	41000	10.1	83%	8.44		85%	8.61	
P-2	CG	Commercial	2669	0.7	83%	0.55		85%	0.56	
P-2	CG	Commercial	5675	1.4	83%	1.17		85%	1.19	
P-2	CG	Commercial	747	0.2	83%	0.15		85%	0.16	
P-2	Employment Center	Commercial	58164	14.4	83%	11.98		85%	12.22	
P-2	Low Density Res	Low Density Residential (1-2 acre lot)	1408	0.3	12%	0.04		7%	0.02	
P-2	Master Planned Community	Low Density Residential (<0.25 acre lot)	159768	39.5	35%	13.82		30%	11.84	
P-2	Mixed Use District	Quasi Public	152444	37.7	79%	29.78		79%	29.76	
P-2	ML	Commercial	185045	45.7	83%	38.10		85%	38.87	
P-2	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1747162	431.7	25%	107.93		20%	86.34	
P-2	OP	Commercial	1813	0.4	83%	0.37		85%	0.38	
P-2	Open Space	Open Space	114	0.0	7%	0.00		5%	0.00	
P-2	Open Space	Open Space	27	0.0	7%	0.00		5%	0.00	
P-2	PDR	Public Places	409361	101.2	47%	47.08		50%	50.58	
P-2	Puyallup	Public Places	0	0.0	47%	0.00		50%	0.00	

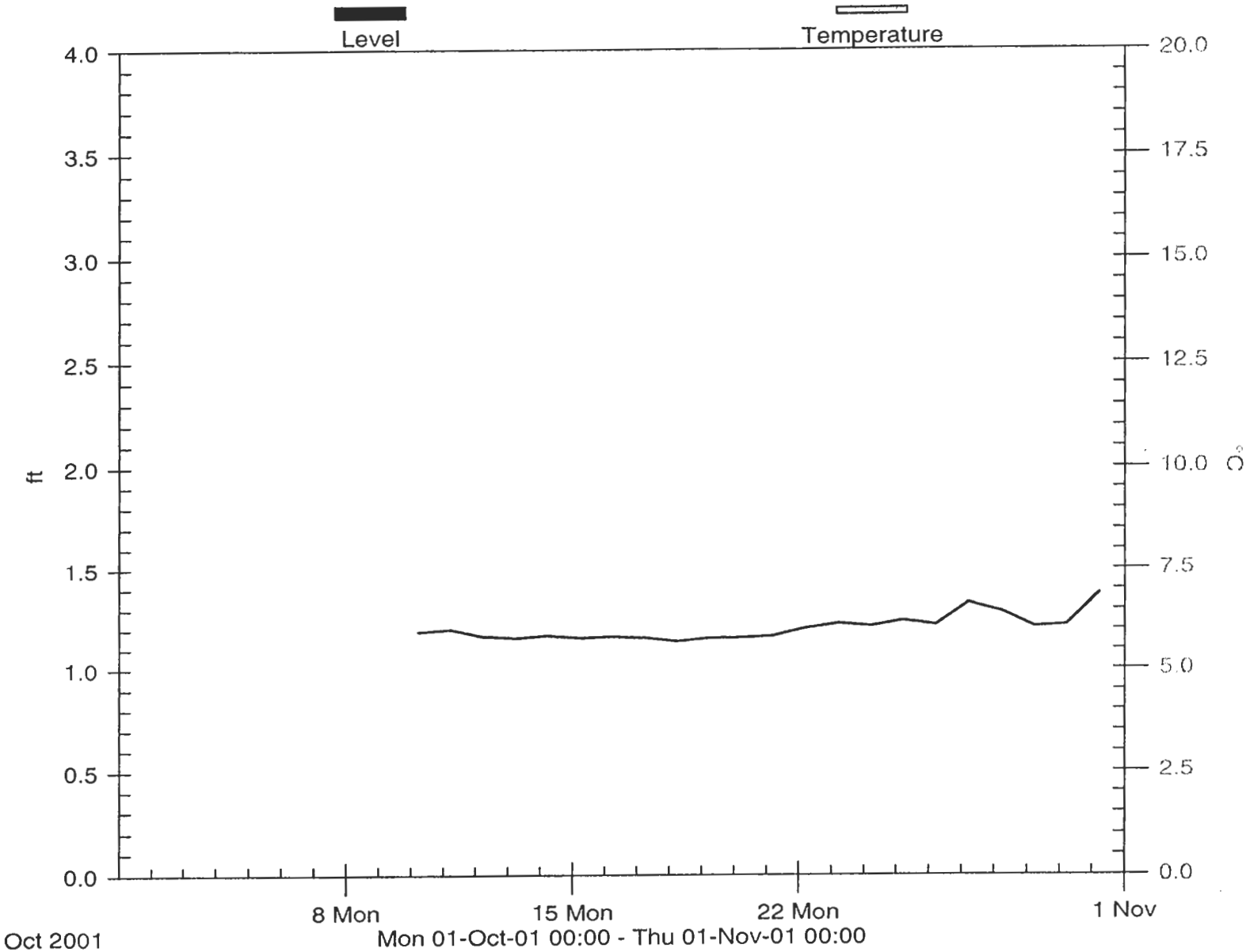
P-2	RS-04	High Density Residential	137403	34.0	44%	15.04		44%	14.94	
P-2	RS-04	High Density Residential	127789	31.6	44%	13.99		44%	13.89	
P-2	RS-08	High Density Residential	318595	78.7	44%	34.87		44%	34.64	
P-2	RS-08	High Density Residential	351684	86.9	44%	38.49		44%	38.24	
P-2	RS-10	Low Density Residential (<0.25 acre lot)	3729028	921.4	35%	322.50		30%	276.43	
P-2	RS-35	Low Density Residential (1-2 acre lot)	761165	188.1	12%	22.57		7%	13.17	
				2059.9		736.79	36%		662.37	32%
VO-1	Agricutural	Agriculture	865790	213.9	4%	8.51		0%	0.00	
VO-1	Agricutural	Agriculture	209590	51.8	4%	2.06		0%	0.00	
VO-1	Agricutural	Agriculture	231943	57.3	4%	2.28		0%	0.00	
VO-1	Agricutural	Agriculture	77416	19.1	4%	0.76		0%	0.00	
VO-1	AM-PM TYPE OF CONVENIENCE	Commercial	2325	0.6	83%	0.48		85%	0.49	
VO-1	AM-PM TYPE OF CONVENIENCE	Commercial	2550	0.6	83%	0.53		85%	0.54	
VO-1	AM-PM TYPE OF CONVENIENCE	Commercial	4385	1.1	83%	0.90		85%	0.92	
VO-1	AM-PM TYPE OF CONVENIENCE	Commercial	5148	1.3	83%	1.06		85%	1.08	
VO-1	ARTERIAL STREETS.	Roads	837	0.2	46%	0.09		45%	0.09	
VO-1	AUTOMOBILE PARKING.	Roads	923	0.2	46%	0.10		45%	0.10	
VO-1	AUTOMOBILE PARKING.	Roads	1861	0.5	46%	0.21		45%	0.21	
VO-1	BANKING SERVICES.	Commercial	2346	0.6	83%	0.48		85%	0.49	
VO-1	CHURCHES, SYNAGOGUES ANI	Religious Center	17391	4.3	50%	2.14		50%	2.15	
VO-1	CURRENT USE - OPEN SPACE	Open Space	47173	11.7	7%	0.82		5%	0.58	
VO-1	DENTAL SERVICES.	Commercial	1665	0.4	83%	0.34		85%	0.35	
VO-1	DESIGNATED FOREST LAND. N	Vacant	493159	121.9	28%	33.82		30%	36.56	
VO-1	DRAINFIELDS/CATCH BASINS. II	Open Space	1364	0.3	7%	0.02		5%	0.02	
VO-1	DRINKING PLACES (TAVERNS -	Commercial	1292	0.3	83%	0.27		85%	0.27	
VO-1	DUPLEX (2 FAMILY UNITS).	Low Density Residential (<0.25 acre lot)	1599	0.4	35%	0.14		30%	0.12	
VO-1	FAST FOOD RESTAURANTS/CA	Commercial	951	0.2	83%	0.20		85%	0.20	
VO-1	FAST FOOD RESTAURANTS/CA	Commercial	2089	0.5	83%	0.43		85%	0.44	
VO-1	FAST FOOD RESTAURANTS/CA	Commercial	3359	0.8	83%	0.69		85%	0.71	
VO-1	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	5795	1.4	44%	0.63		44%	0.63	
VO-1	FIVE (5) OR MORE FAMILY UNIT	High Density Residential	5874	1.5	44%	0.64		44%	0.64	
VO-1	GOVERNMENTAL SERVICES	Public Places	228	0.1	47%	0.03		50%	0.03	
VO-1	GREENBELTS AND COMMON AI	Open Space	103	0.0	7%	0.00		5%	0.00	
VO-1	GREENBELTS AND COMMON AI	Open Space	287	0.1	7%	0.00		5%	0.00	
VO-1	GROCERIES (WITH OR WITHOU	Commercial	9315	2.3	83%	1.92		85%	1.96	
VO-1	LAND THAT FORMERLY HAD DV	Mobile Home	3340	0.8	23%	0.19		18%	0.15	
VO-1	LIBRARIES.	Public Places	7665	1.9	47%	0.88		50%	0.95	
VO-1	LOCAL ACCESS STREETS.	Road	747	0.2	4%	0.01		0%	0.00	
VO-1	Low Density Res	Low Density Residential (1-2 acre lot)	4019	1.0	12%	0.12		7%	0.07	
VO-1	Low Density Res	Low Density Residential (1-2 acre lot)	3469	0.9	12%	0.10		7%	0.06	
VO-1	Low Density Res	Low Density Residential (1-2 acre lot)	3695	0.9	12%	0.11		7%	0.06	
VO-1	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	1583	0.4	30%	0.12		25%	0.10	
VO-1	Low Density Residential 12000	Low Density Residential (0.25-0.35 acre lot)	846	0.2	30%	0.06		25%	0.05	
VO-1	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	99	0.0	79%	0.02		79%	0.02	
VO-1	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	1032	0.3	79%	0.20		79%	0.20	
VO-1	MEDICAL CLINICS - OUT-PATIEI	Quasi Public	2530	0.6	79%	0.49		79%	0.49	
VO-1	MINI LUBES SERVICE	Commercial	2275	0.6	83%	0.47		85%	0.48	
VO-1	MINI-WAREHOUSE	Commercial	3571	0.9	83%	0.74		85%	0.75	
VO-1	MISCELLANEOUS OFFICE SPAC	Commercial	2531	0.6	83%	0.52		85%	0.53	
VO-1	MISCELLANEOUS OFFICE SPAC	Commercial	8810	2.2	83%	1.81		85%	1.85	
VO-1	MOBILE HOME(S)	Mobile Home	878	0.2	23%	0.05		18%	0.04	
VO-1	Moderate Density Single Family	Low Density Residential (0.35-0.50 acre lots)	1034236	255.6	25%	63.89		20%	51.11	
VO-1	NURSERY SCHOOLS.	Elementary School	4076	1.0	24%	0.25		30%	0.30	

VO-1	OTHER AUTOMOBILE SERVICE	Commercial	2359	0.6	83%	0.49		85%	0.50	
VO-1	OTHER MEDICAL AND HEALTH	Quasi Public	1176	0.3	79%	0.23		79%	0.23	
VO-1	RESIDENTIAL VACANT LAND TI	Open Space	3568	0.9	7%	0.06		5%	0.04	
VO-1	ROAD	Road	4078	1.0	4%	0.04		0%	0.00	
VO-1	ROAD	Road	199466	49.3	4%	1.97		0%	0.00	
VO-1	Road	Road	5573	1.4	4%	0.06		0%	0.00	
VO-1	Rural Five	Low Density Residential (5-10 acre lot)	2631453	650.2	5%	32.51		2%	13.00	
VO-1	SAND AND GRAVEL - QUARRYI	Resource Land	0	0.0	4%	0.00		0%	0.00	
VO-1	SAND AND GRAVEL - QUARRYI	Resource Land	20	0.0	4%	0.00		0%	0.00	
VO-1	SAND AND GRAVEL - QUARRYI	Resource Land	507	0.1	4%	0.01		0%	0.00	
VO-1	SINGLE FAMILY DWELLING.	Low Density Residential (<0.25 acre lot)	518800	128.2	35%	44.87		30%	38.46	
VO-1	Sumner	Public Places	19	0.0	47%	0.00		50%	0.00	
VO-1	TIRES, BATTERIES AND ACCES	Commercial	2843	0.7	83%	0.59		85%	0.60	
VO-1	VACANT COMMERCIAL LAND.	Commercial	191110	47.2	83%	39.35		85%	40.14	
VO-1	VACANT LAND - RESIDENTIAL.	Low Density Residential (<0.25 acre lot)	591802	146.2	35%	51.18		30%	43.87	
VO-1	VACANT RESIDENTIAL LAND, S	Low Density Residential (<0.25 acre lot)	8608	2.1	35%	0.74		30%	0.64	
VO-1	WATER STORAGE. REF. MANU/	Water	2145	0.5	0%	0.00		0%	0.00	
				1790.4		301.69	17%		243.27	14%

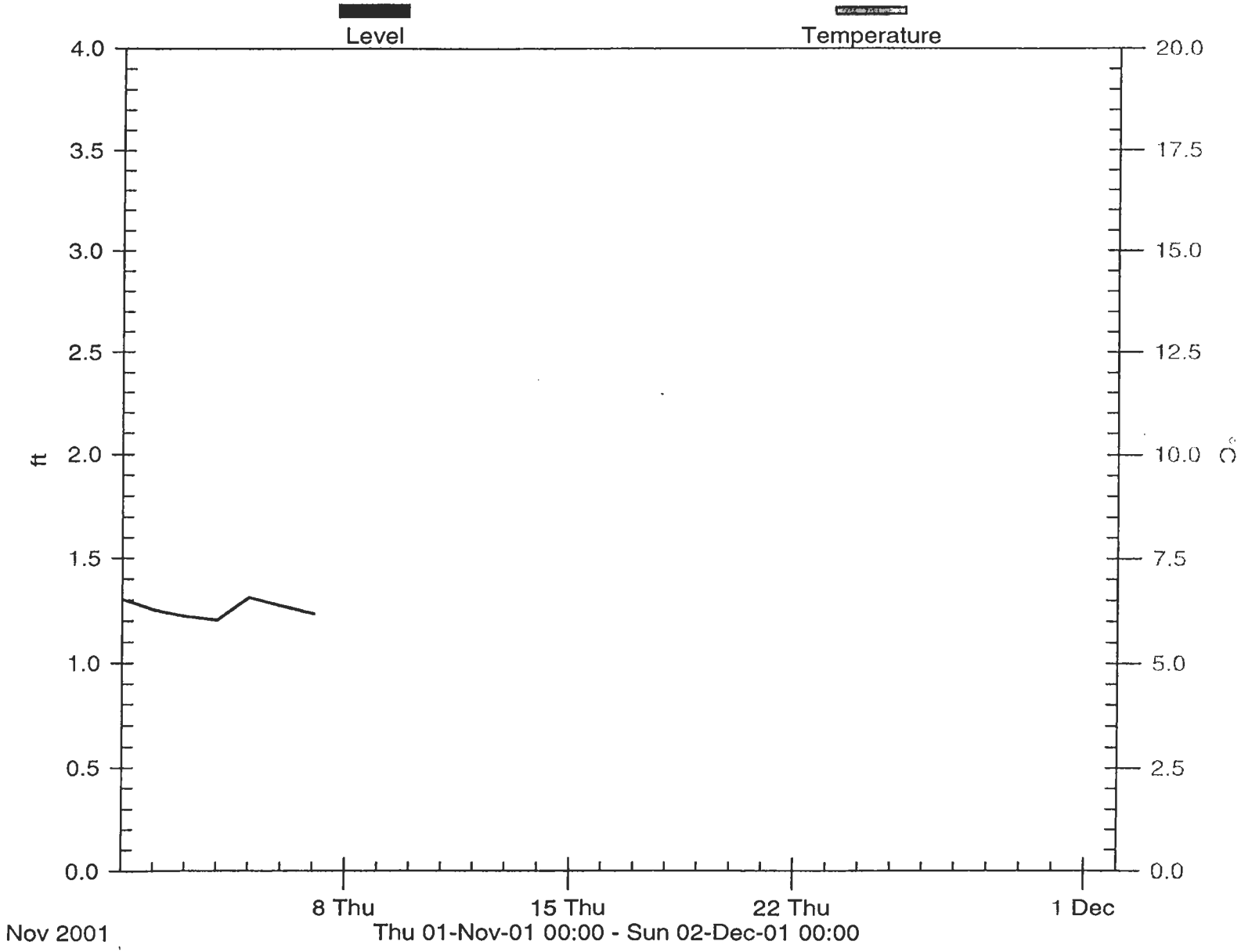
APPENDIX E

STAGE AND TEMPERATURE DATA

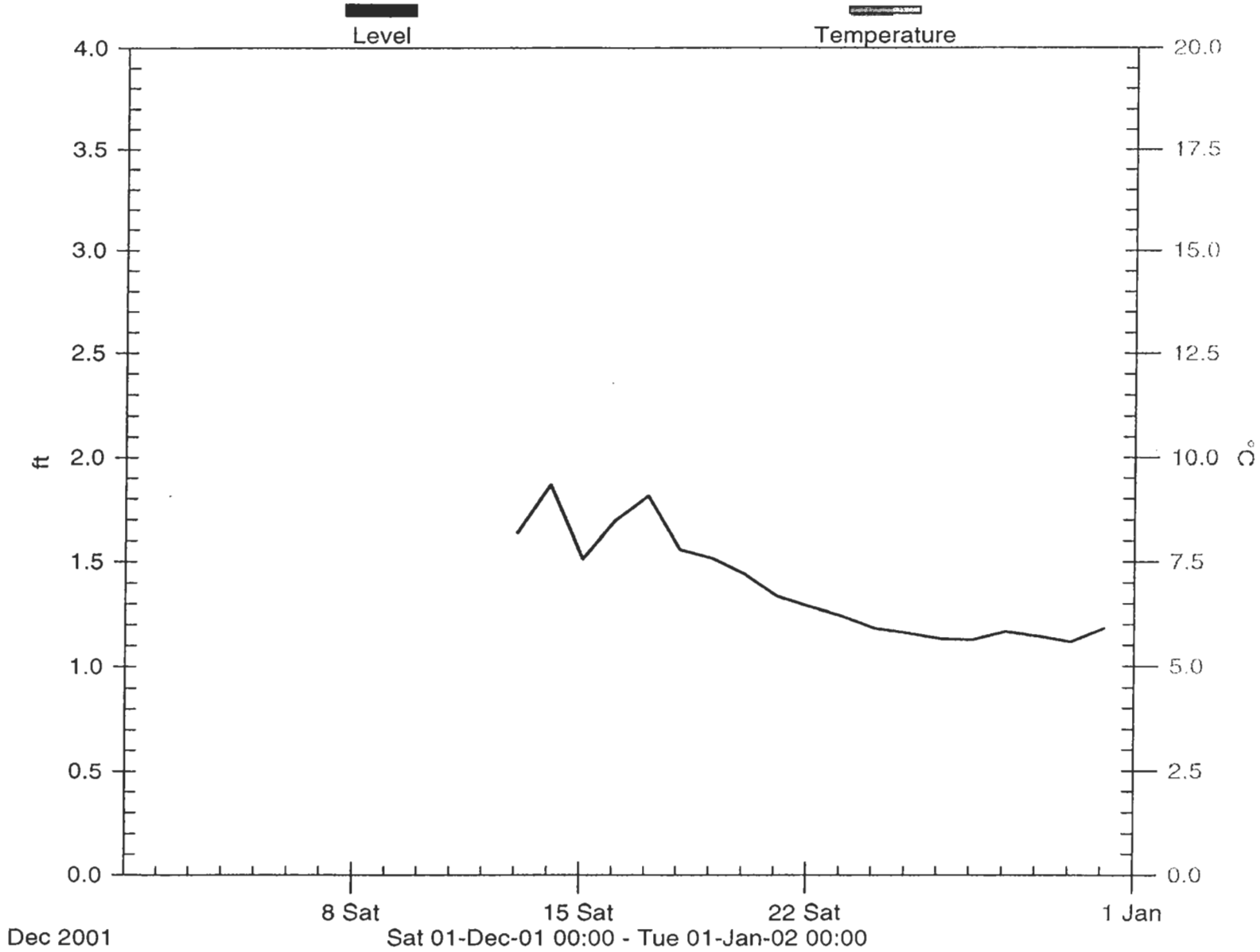
Site 1 - Lower Fennel Creek



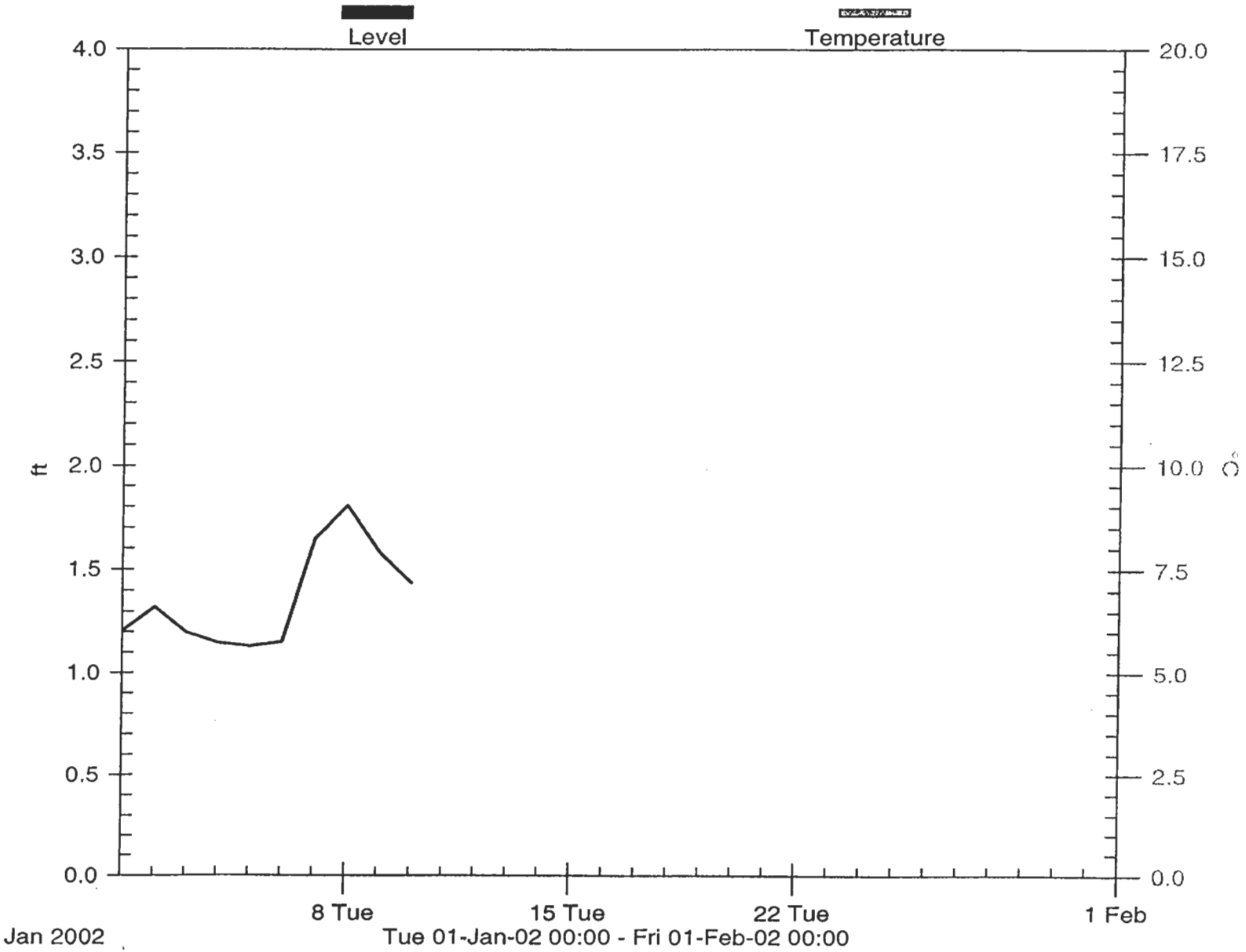
Site 1 - Lower Fennel Creek



Site 1 - Lower Fennel Creek



Site 1 - Lower Fennel Creek



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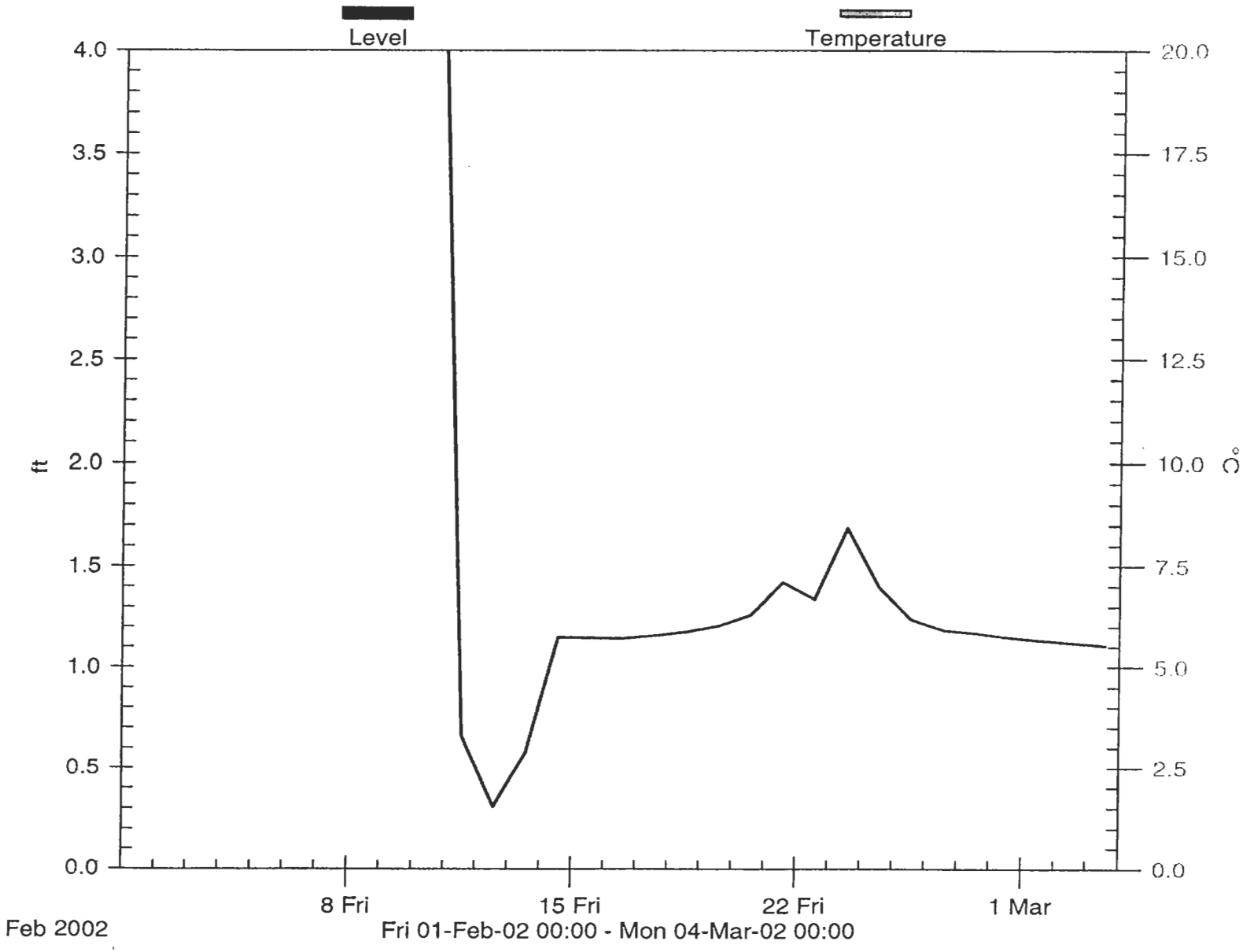

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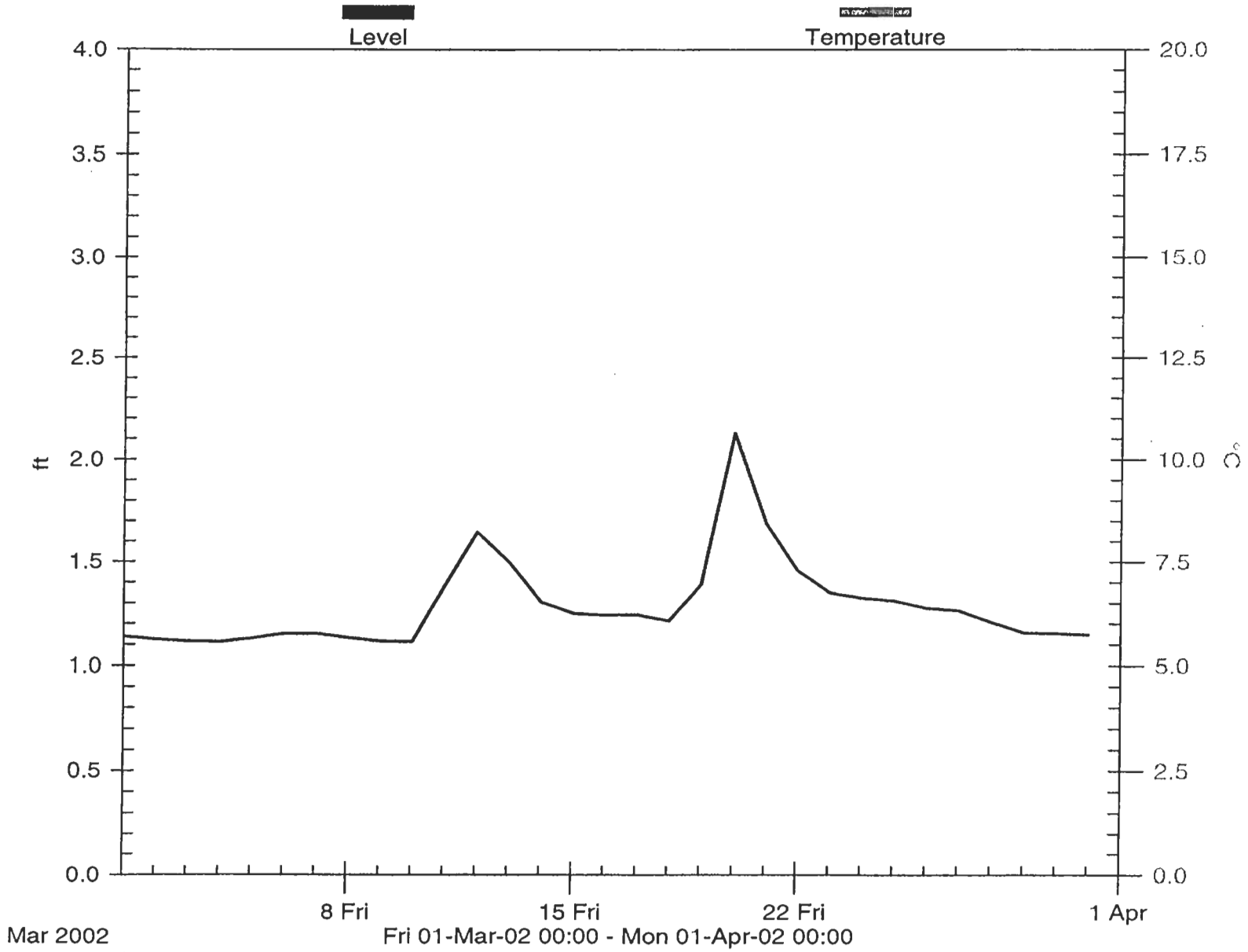

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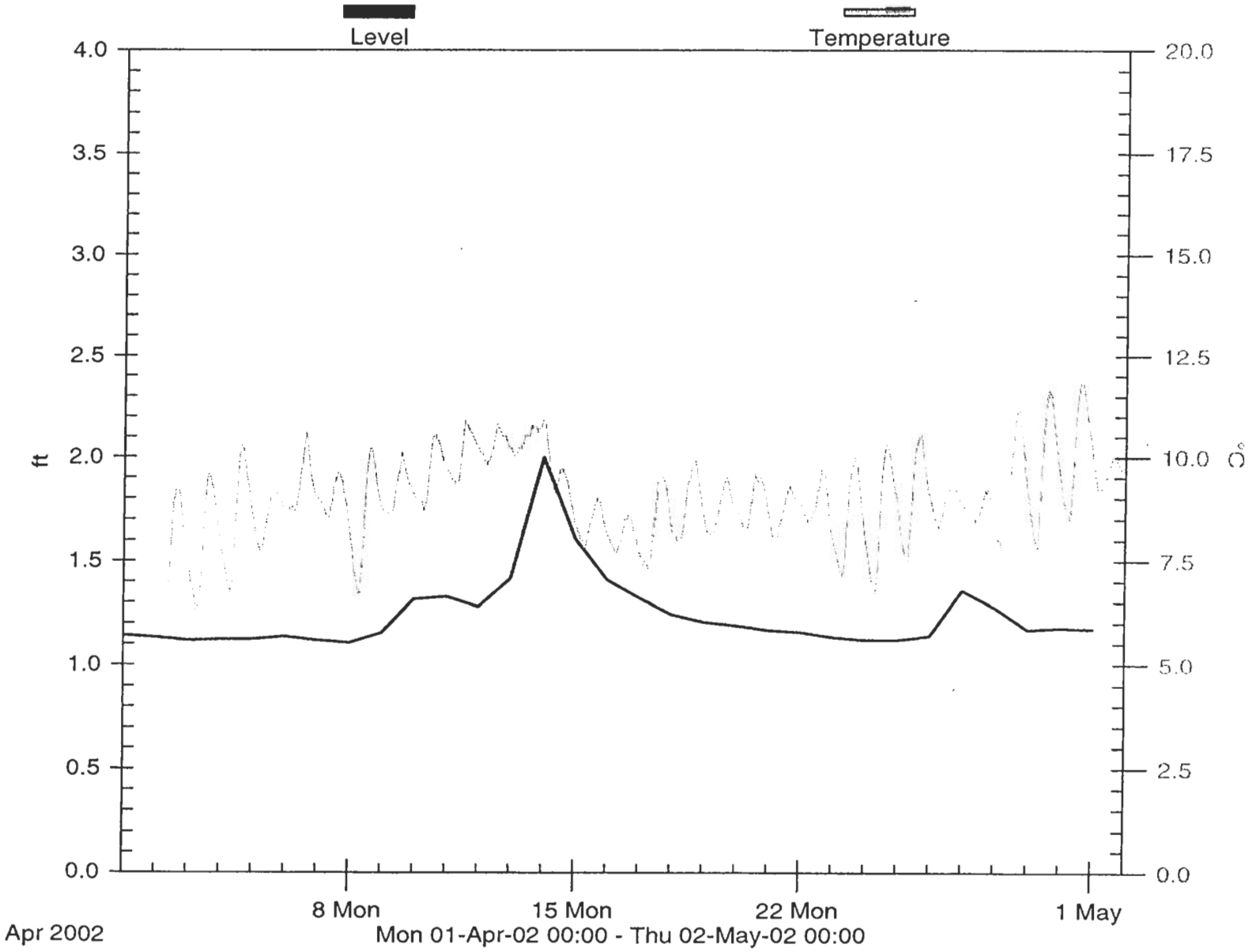

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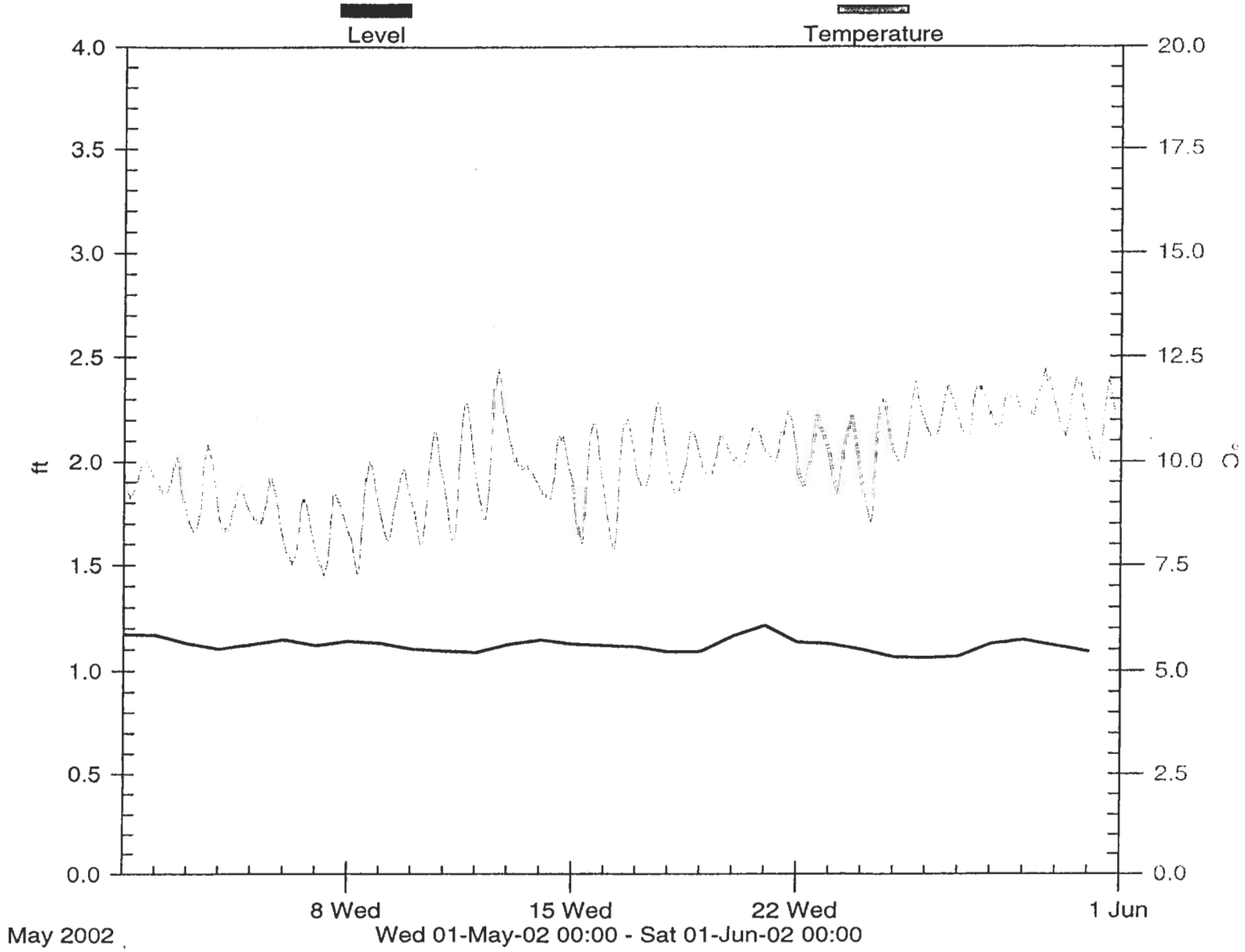

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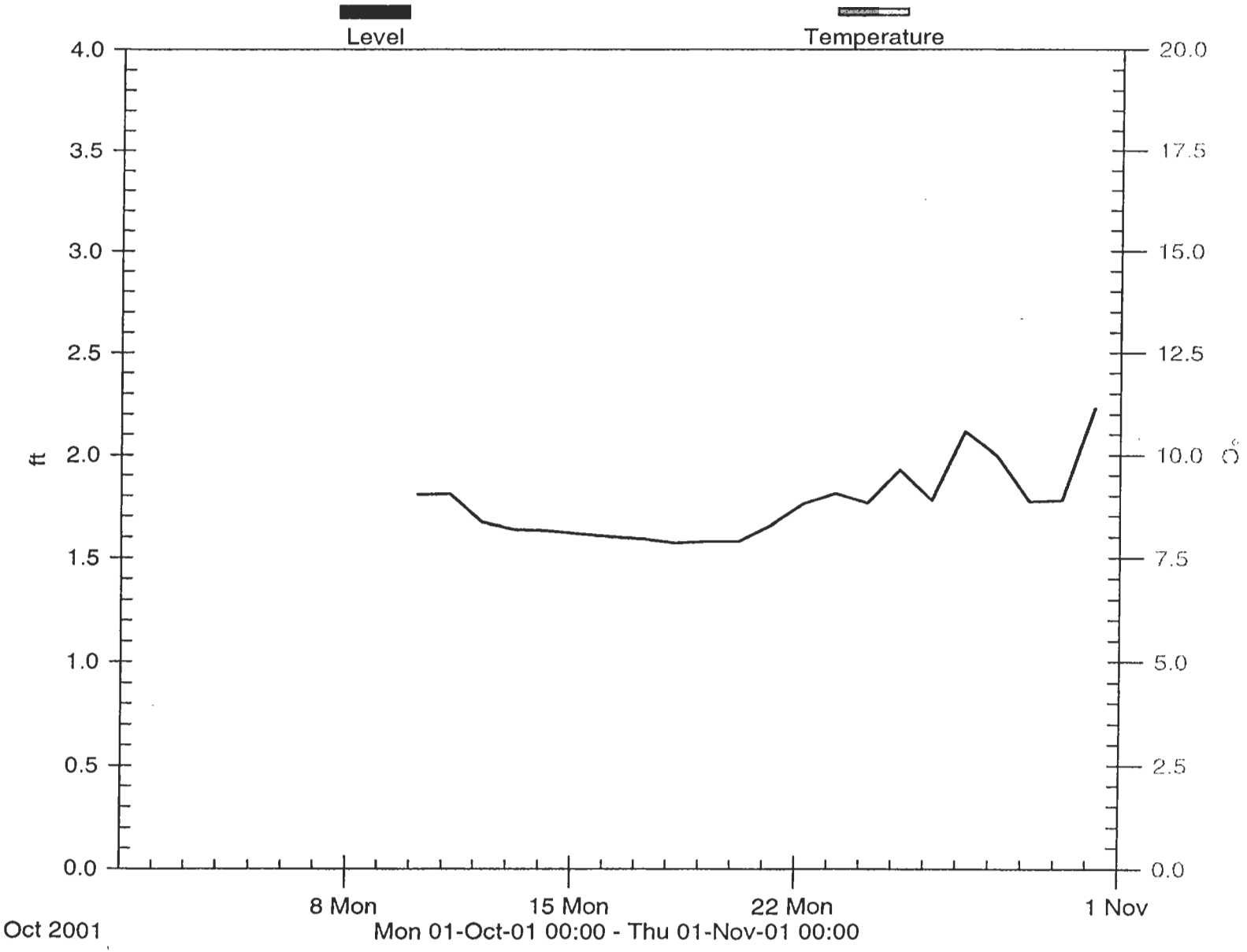

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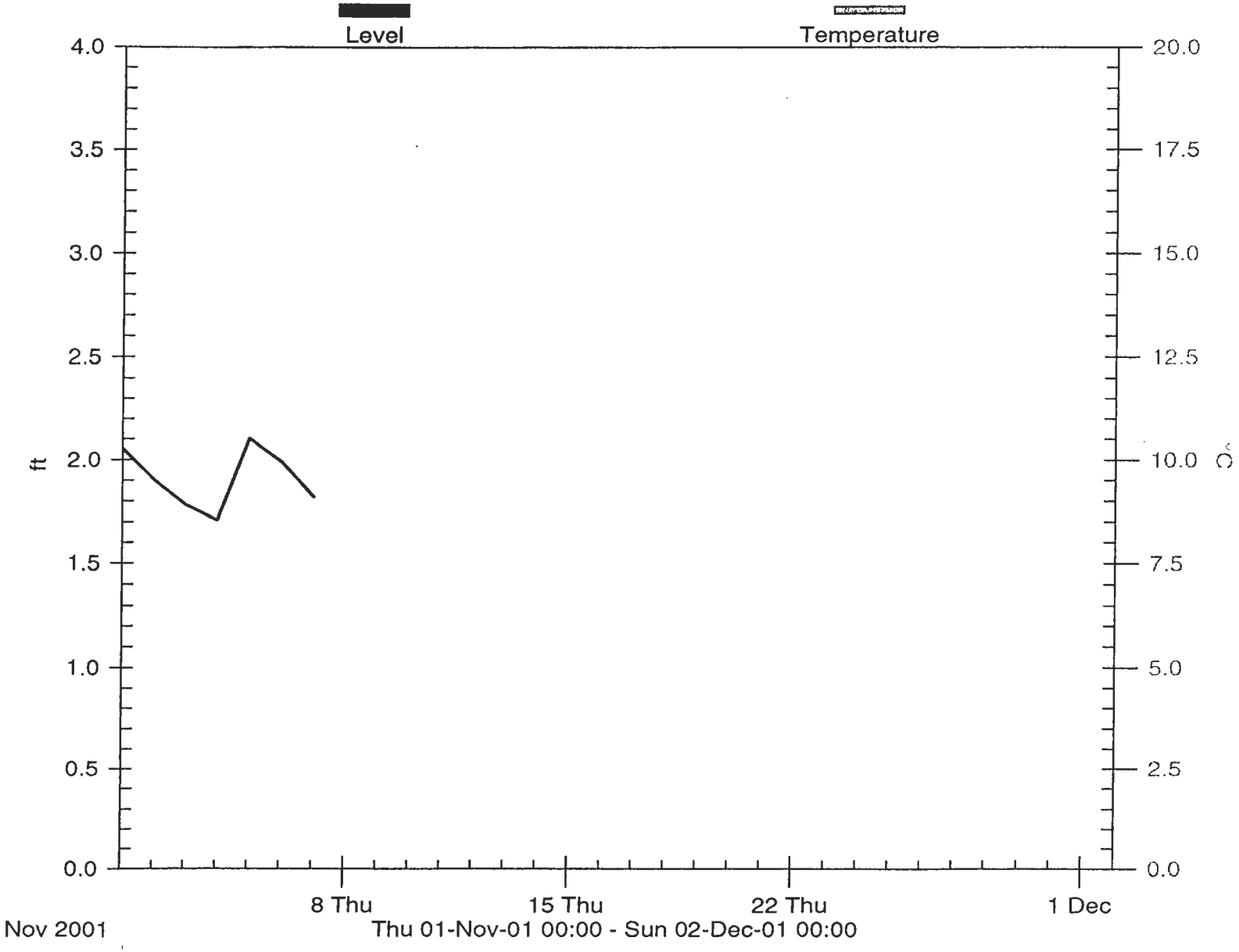

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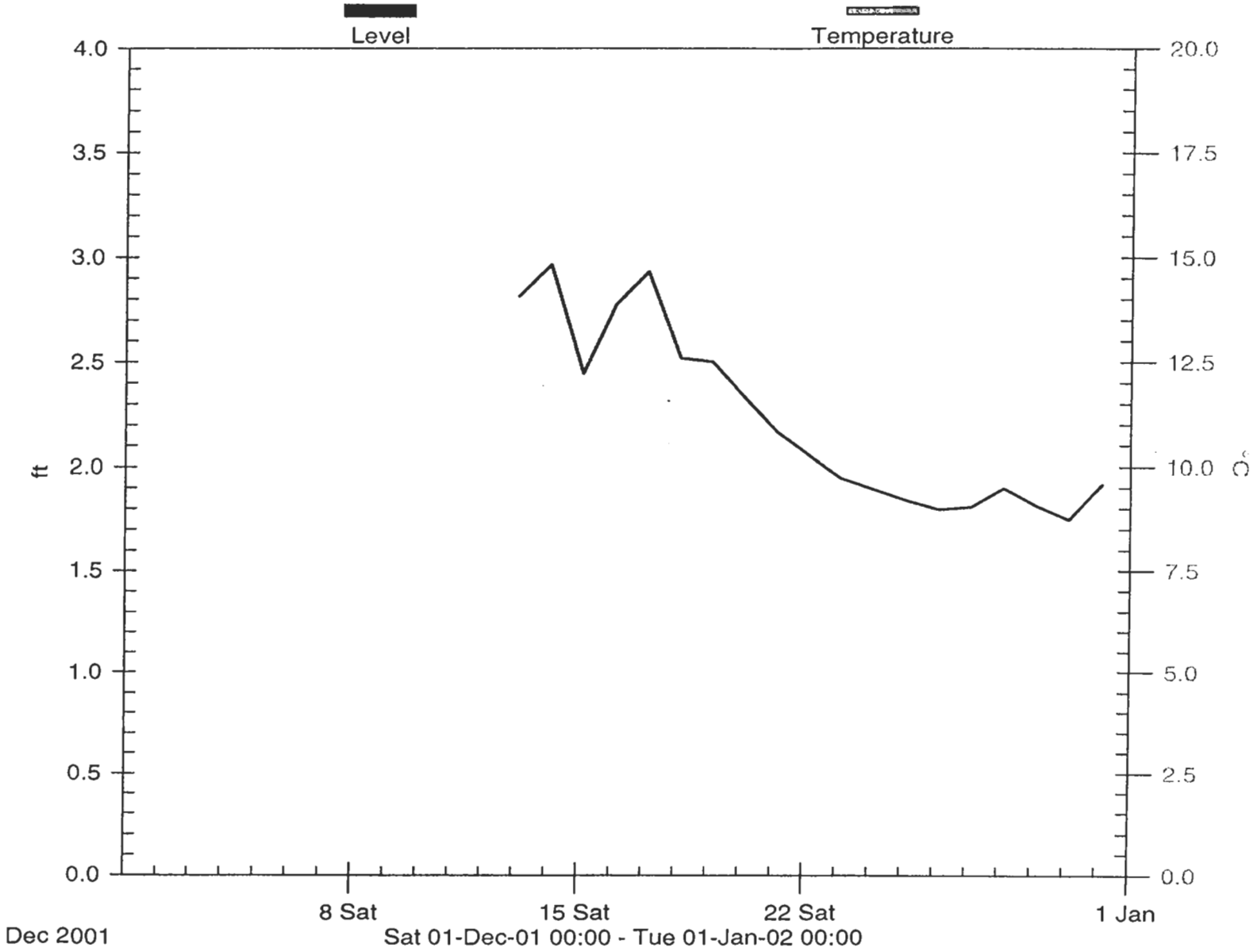

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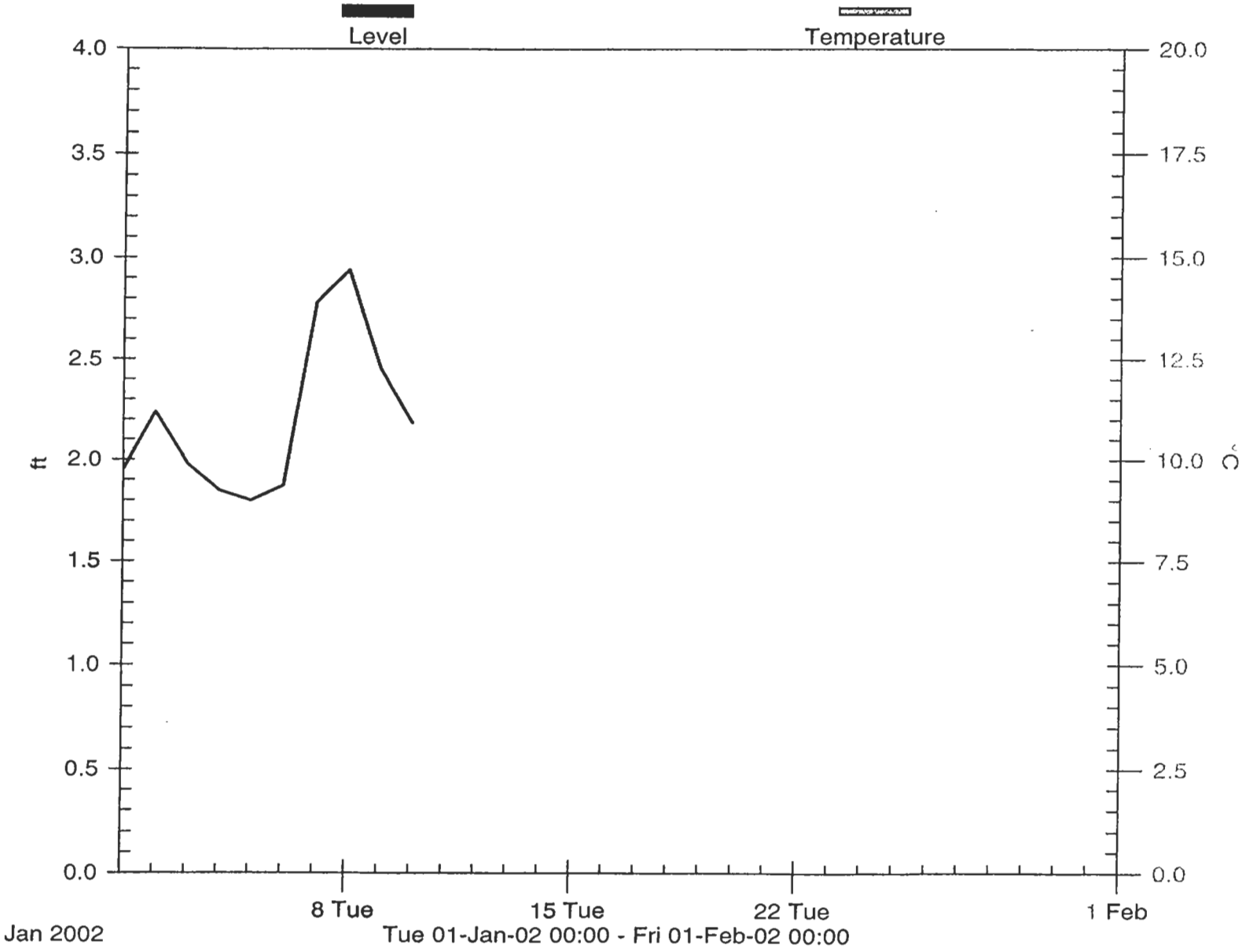

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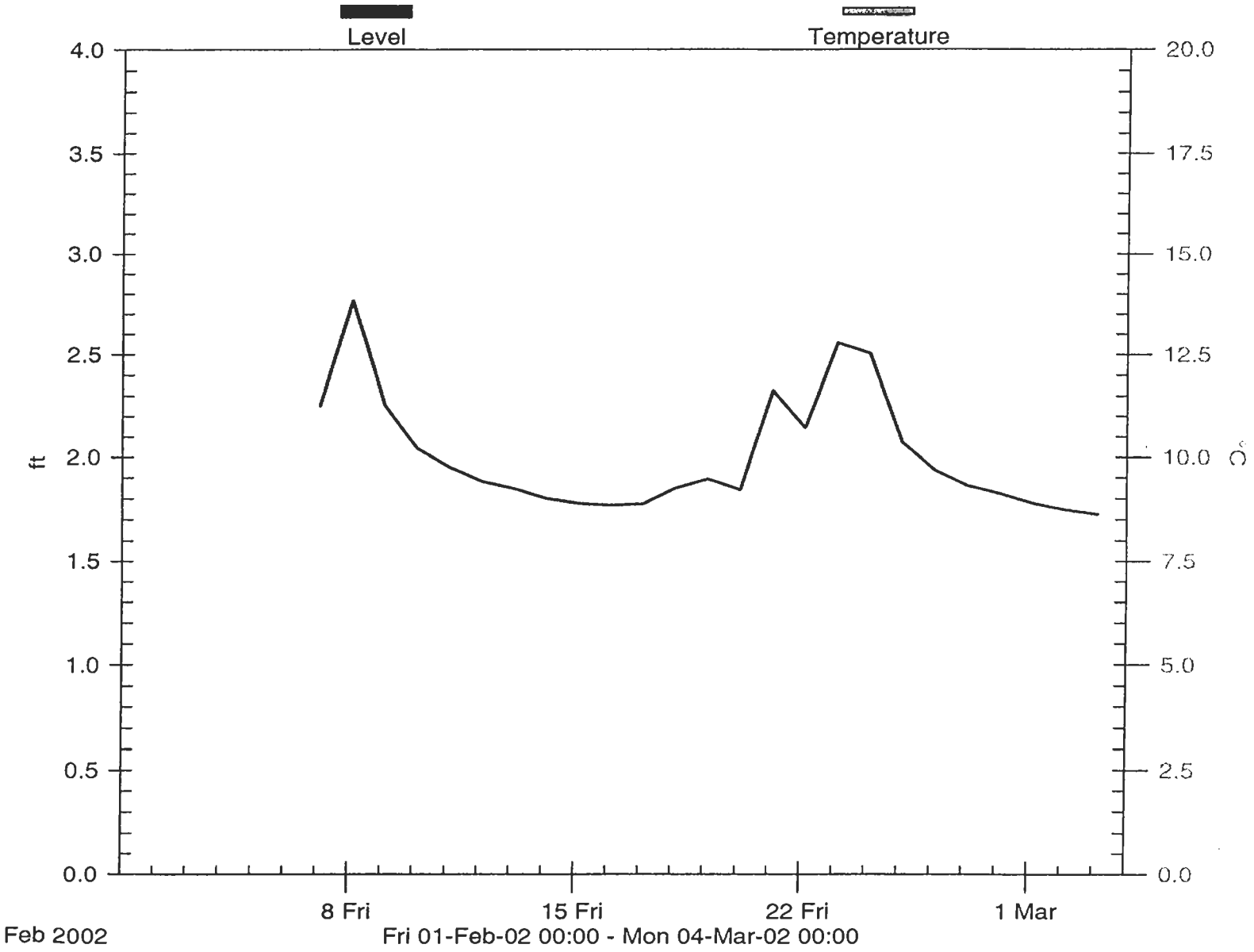

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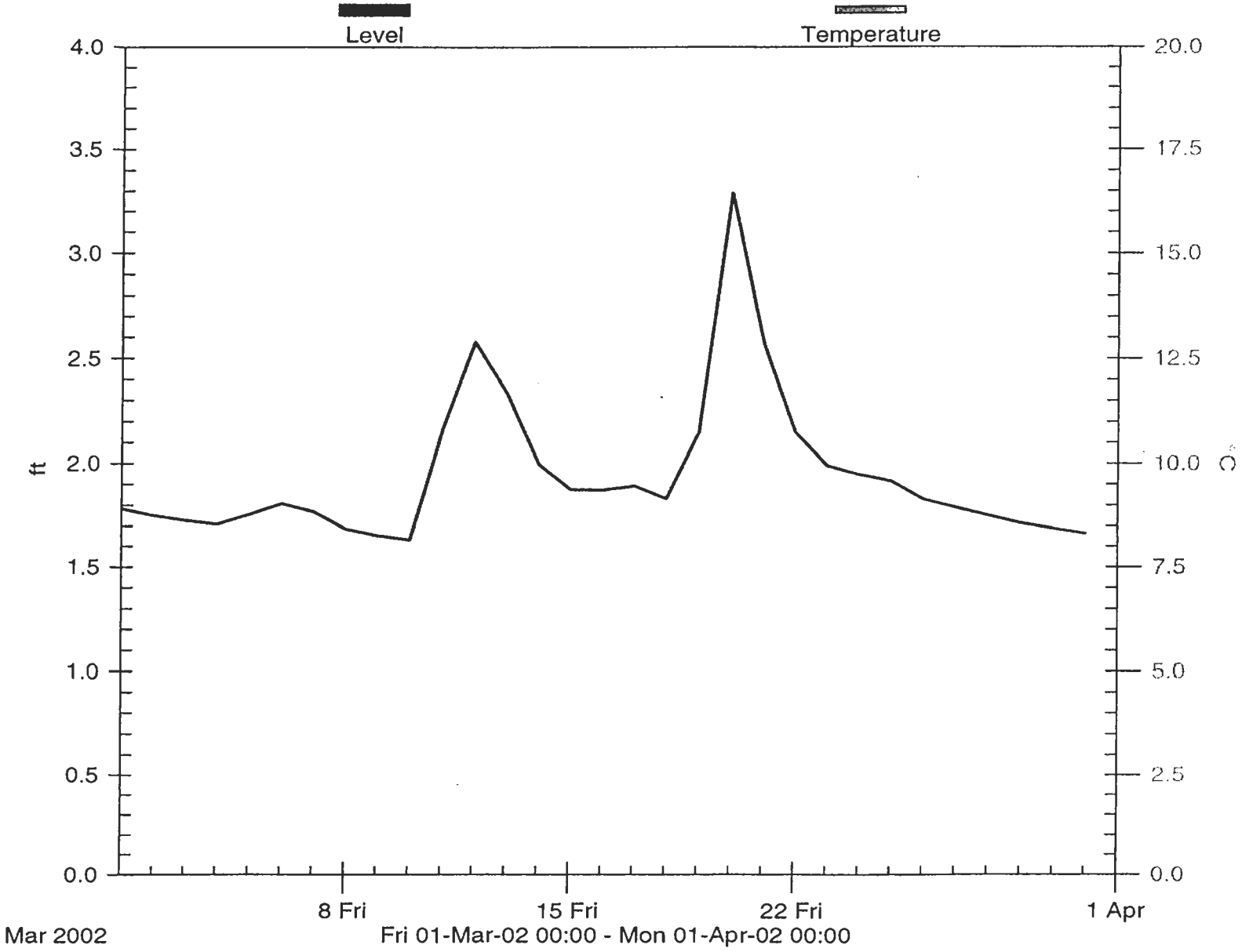

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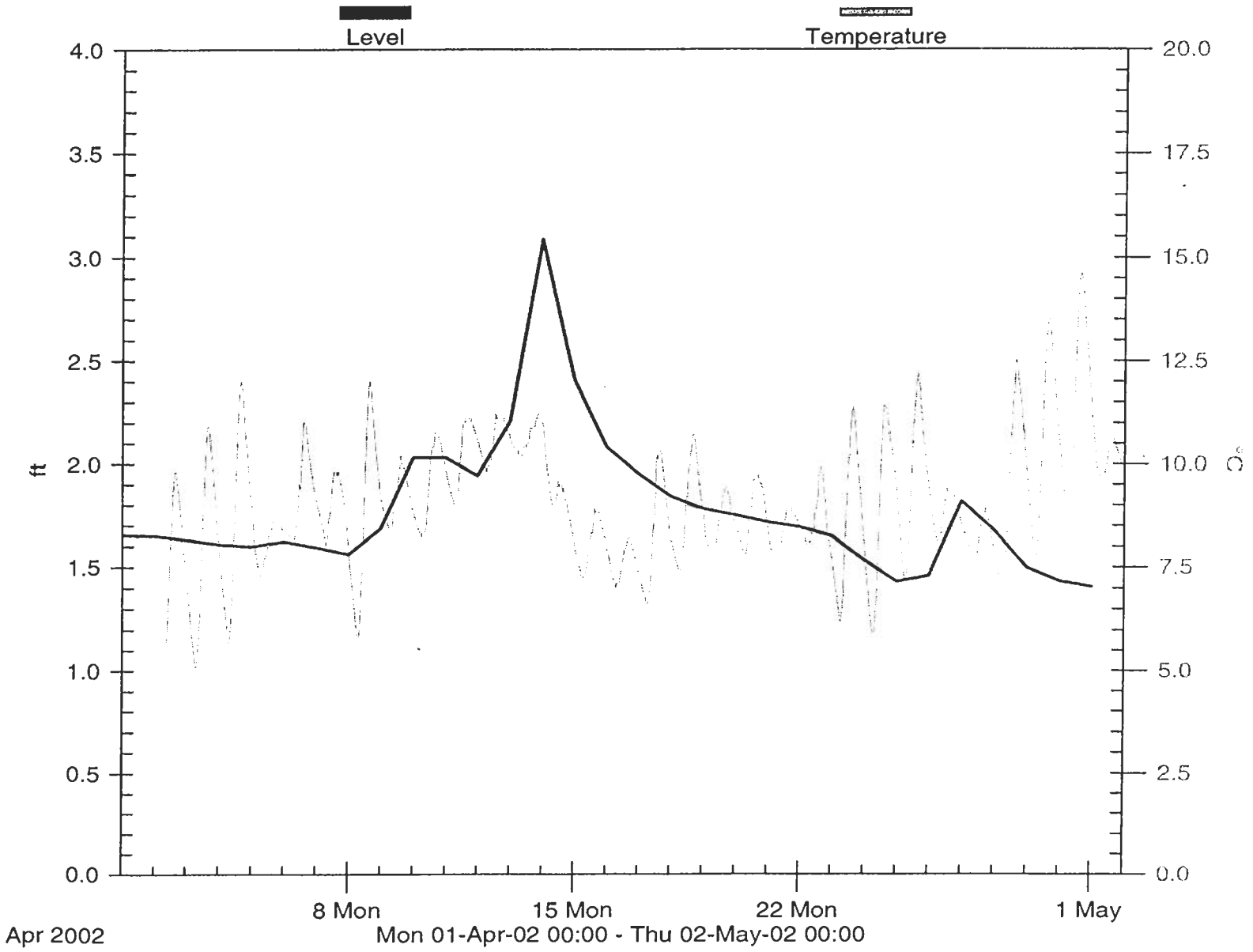
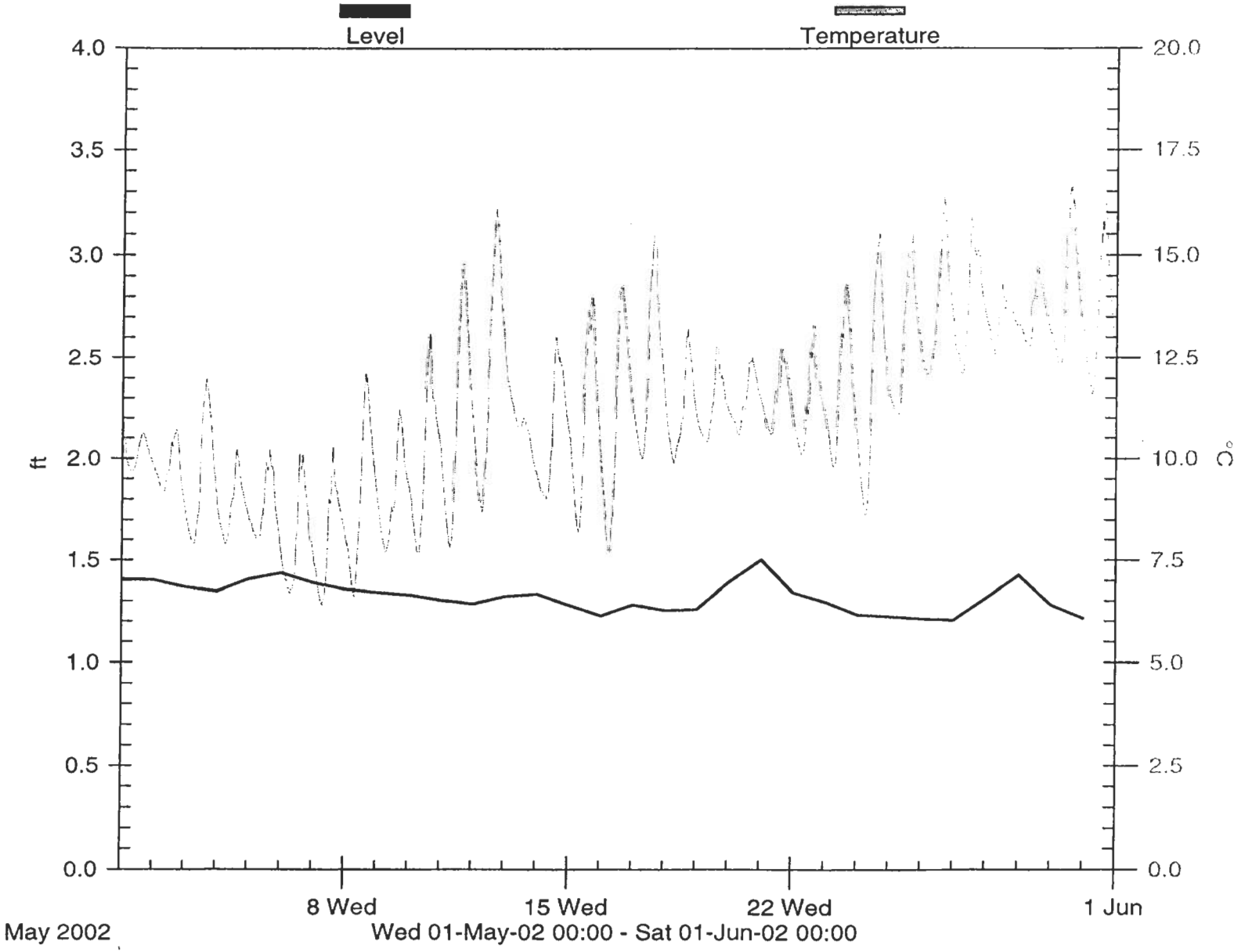
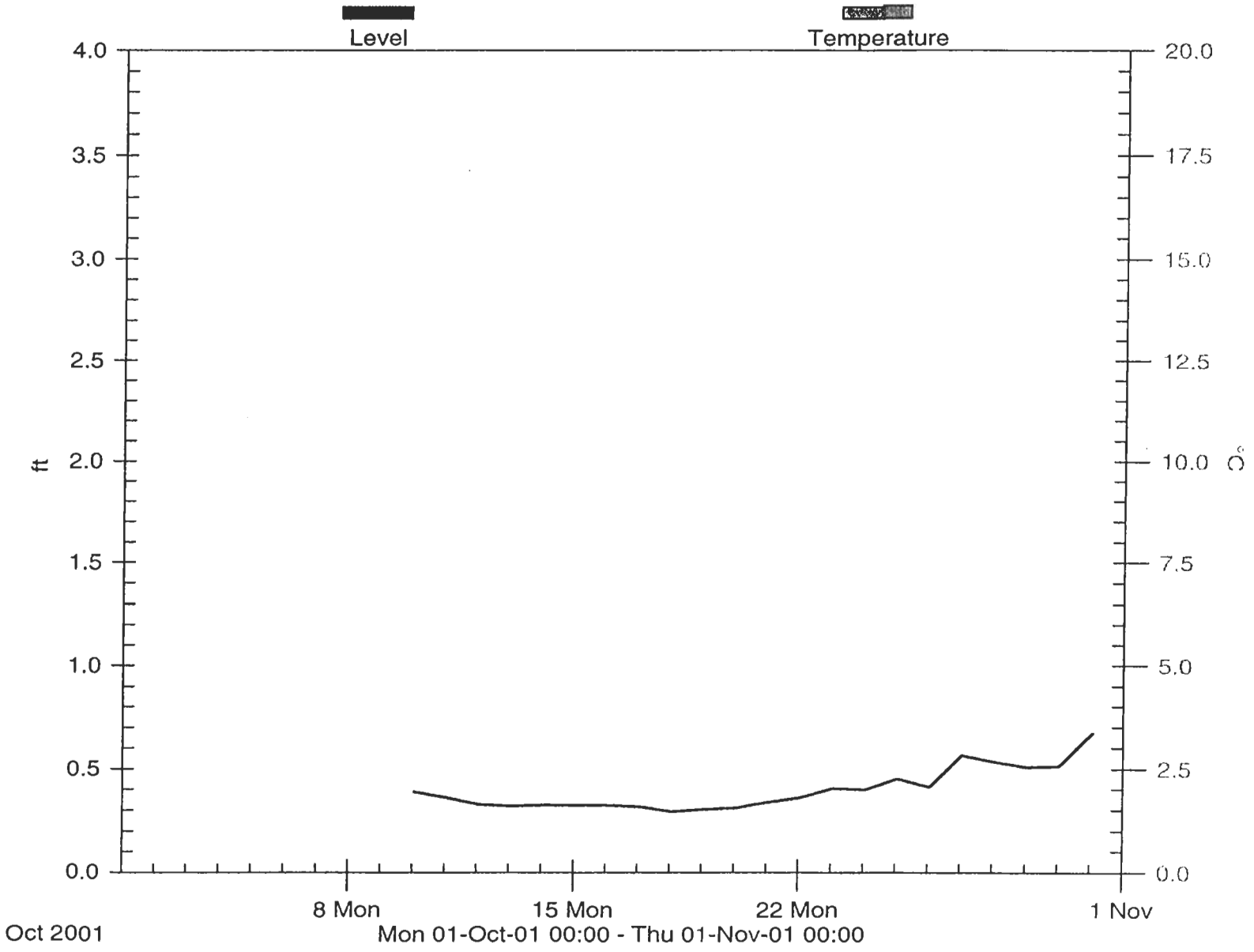


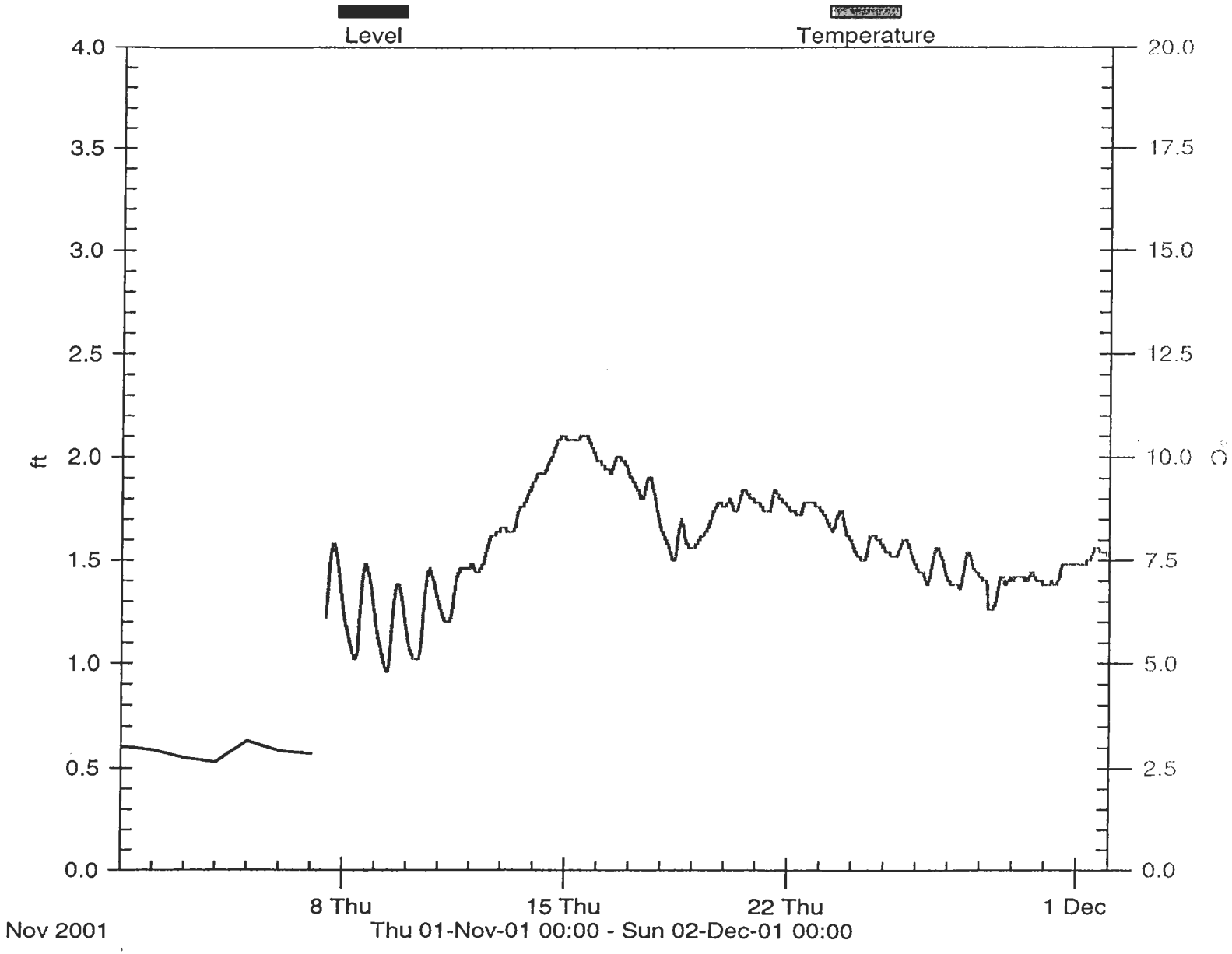
Site 2 - Upper Fennel Creek



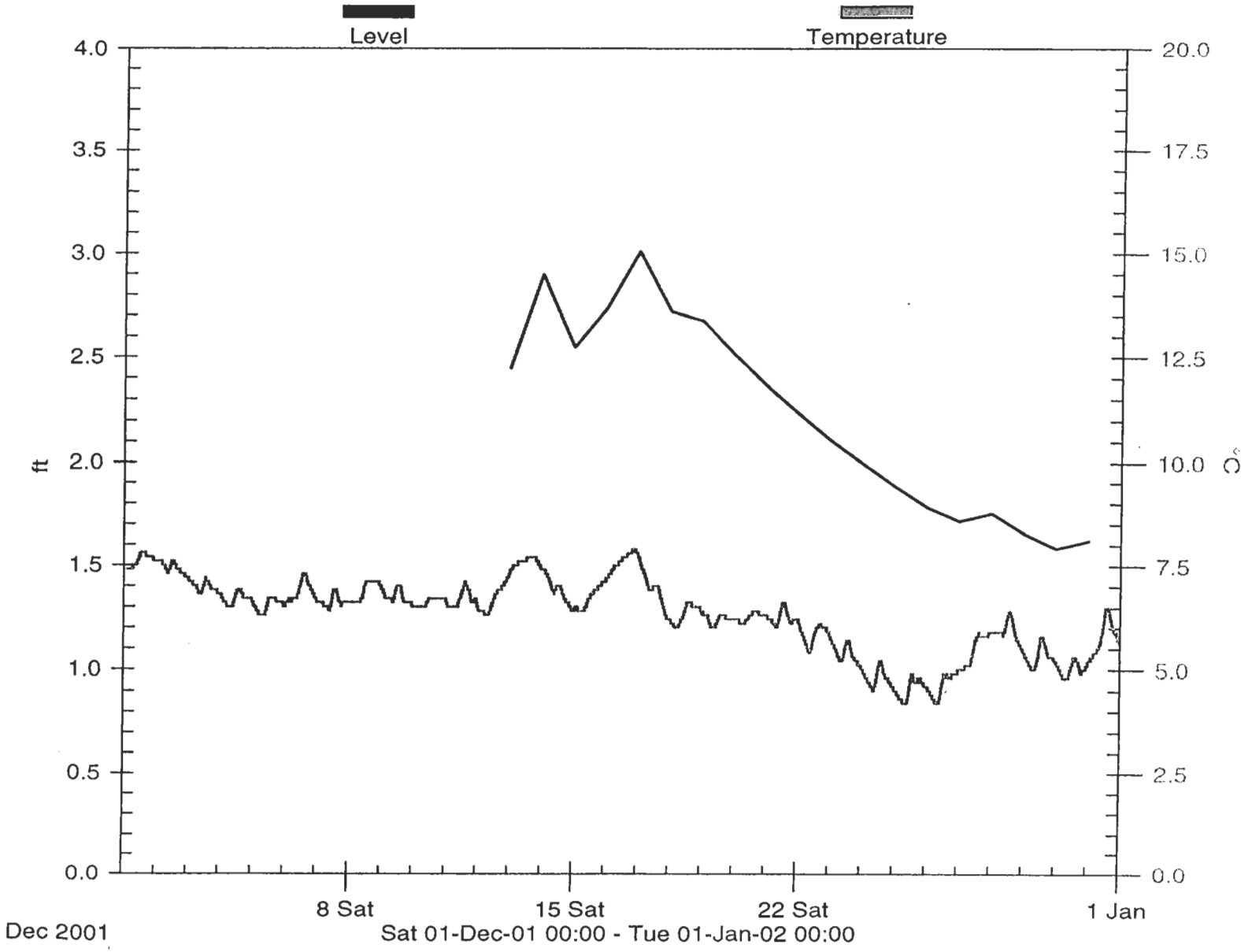
Site 3 - Horse Haven Creek



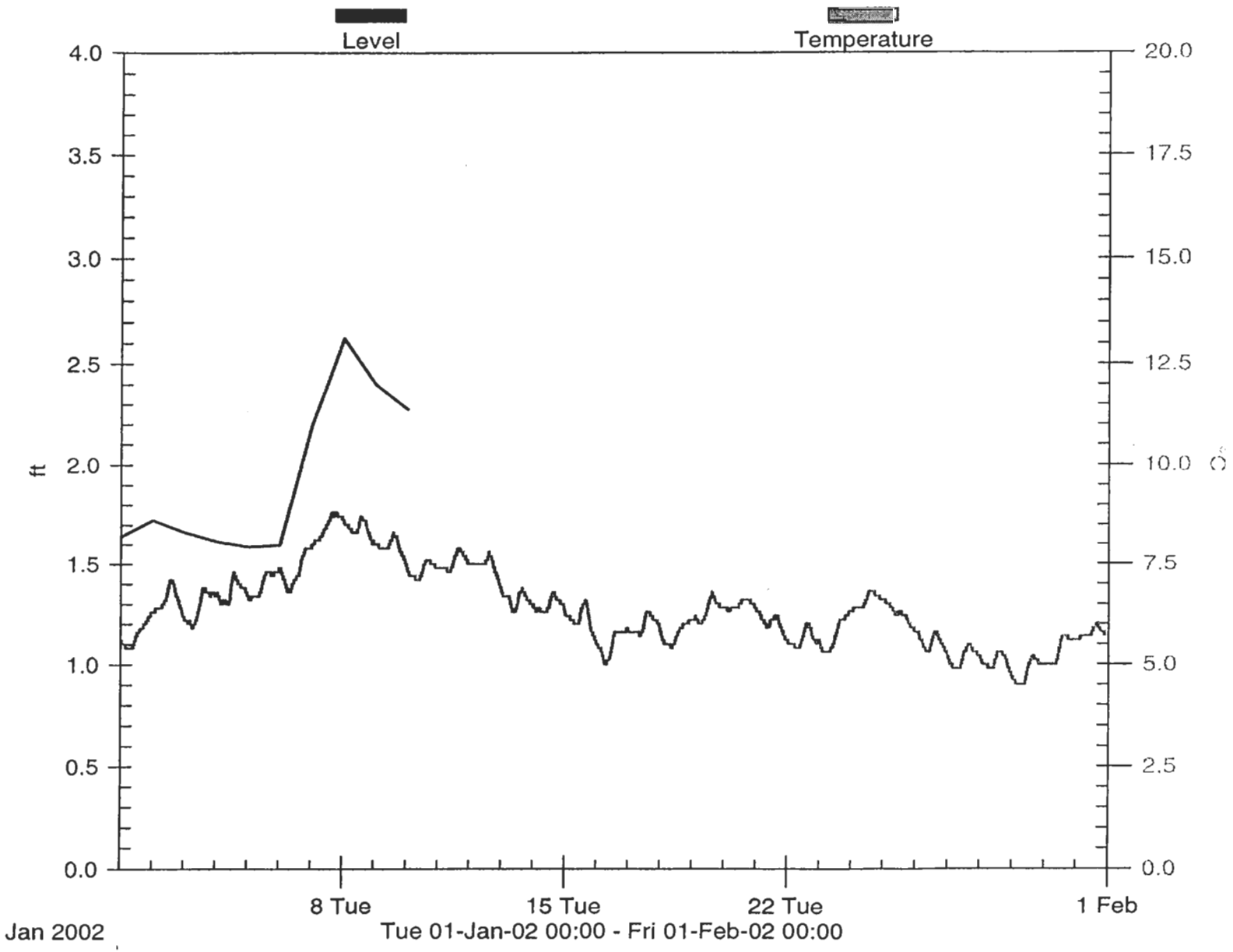
Site 3 - Horse Haven Creek



Site 3 - Horse Haven Creek



Site 3 - Horse Haven Creek



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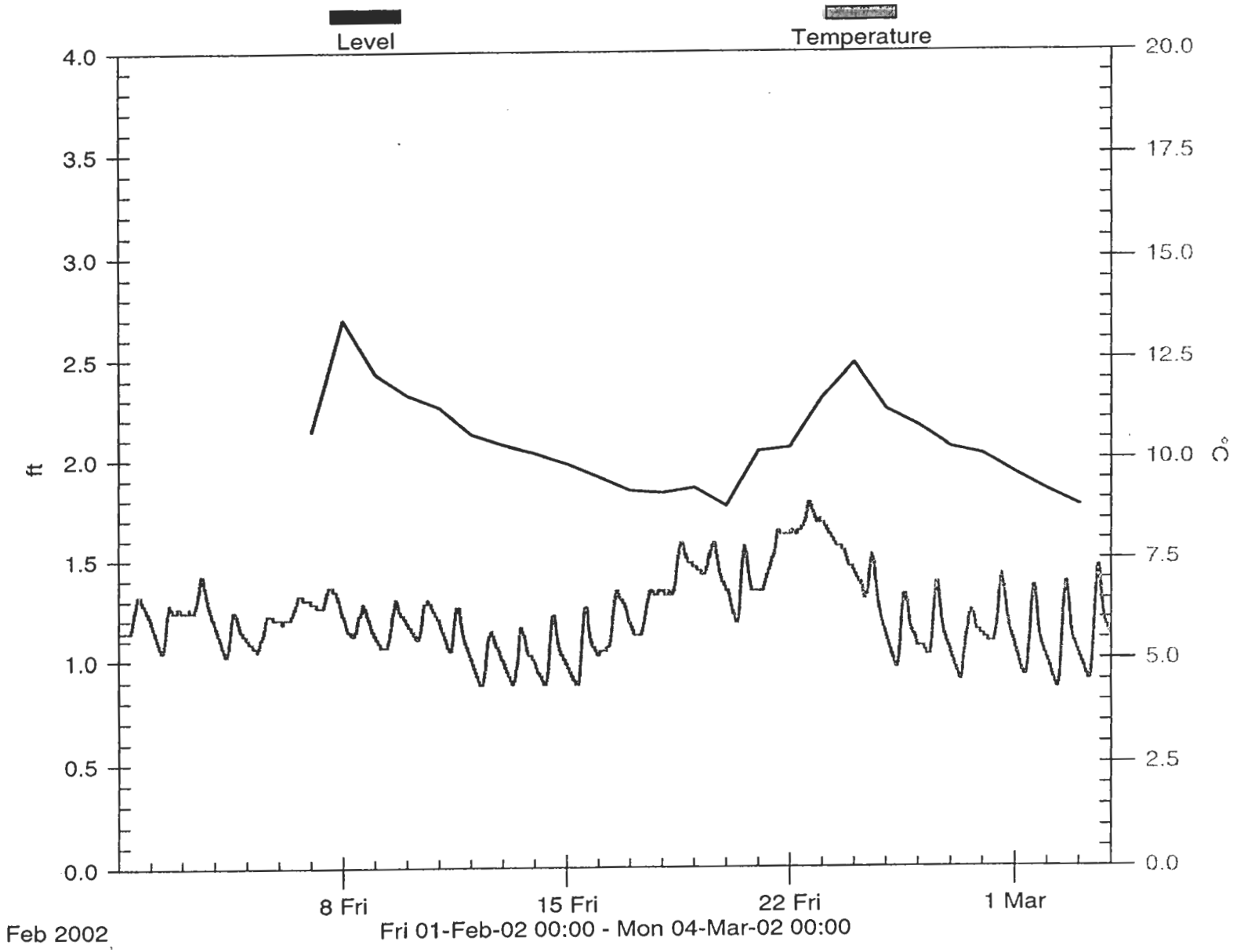
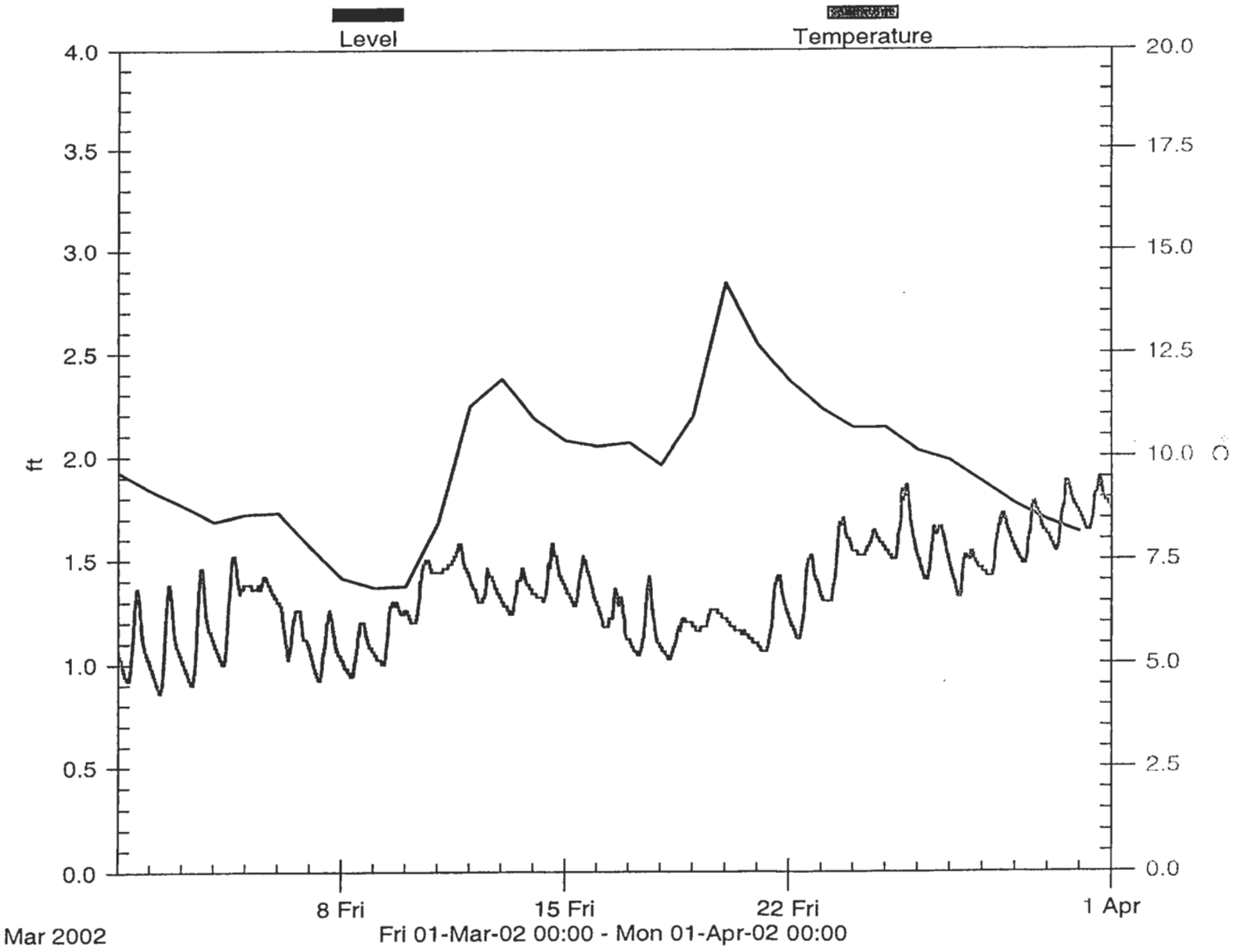
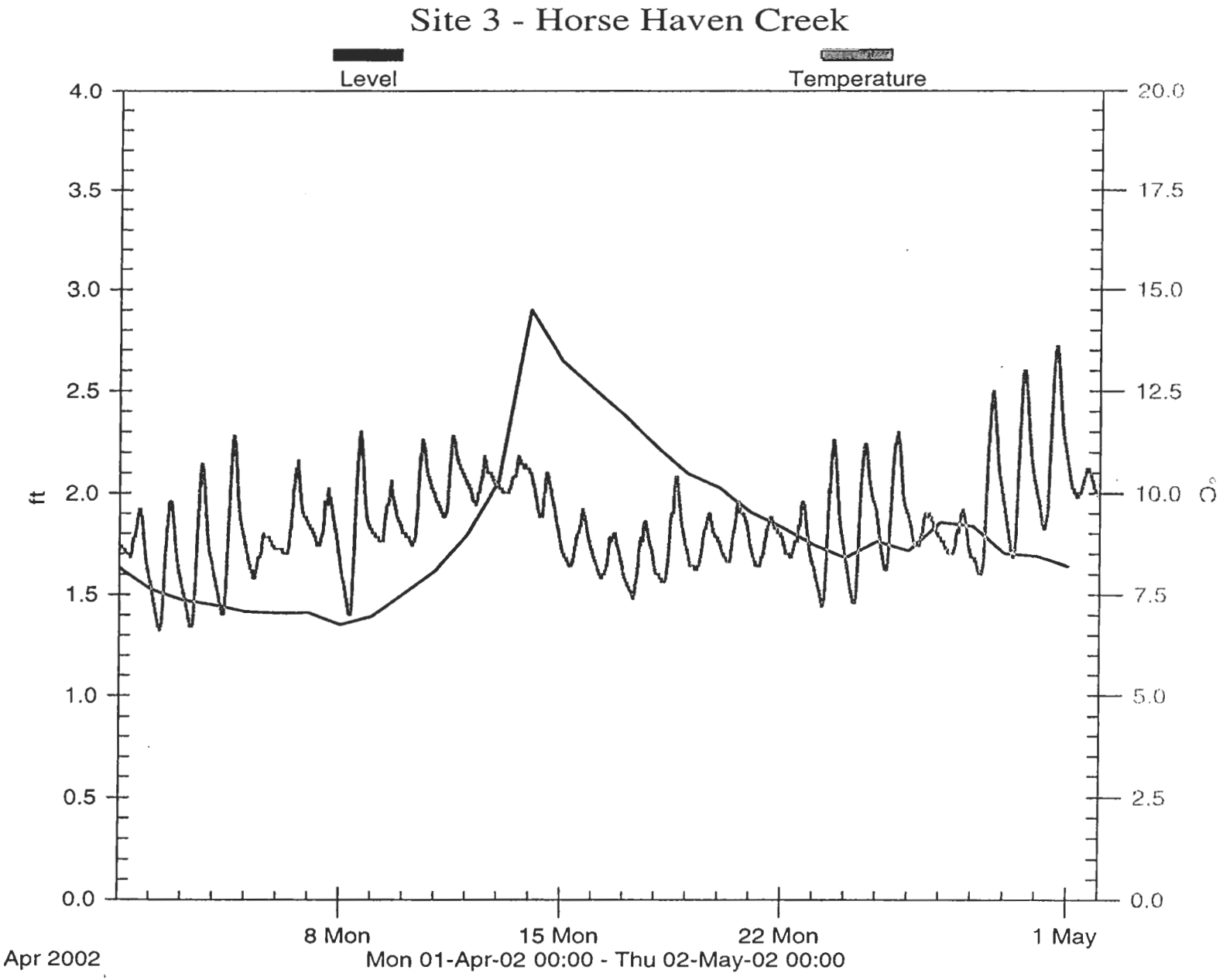
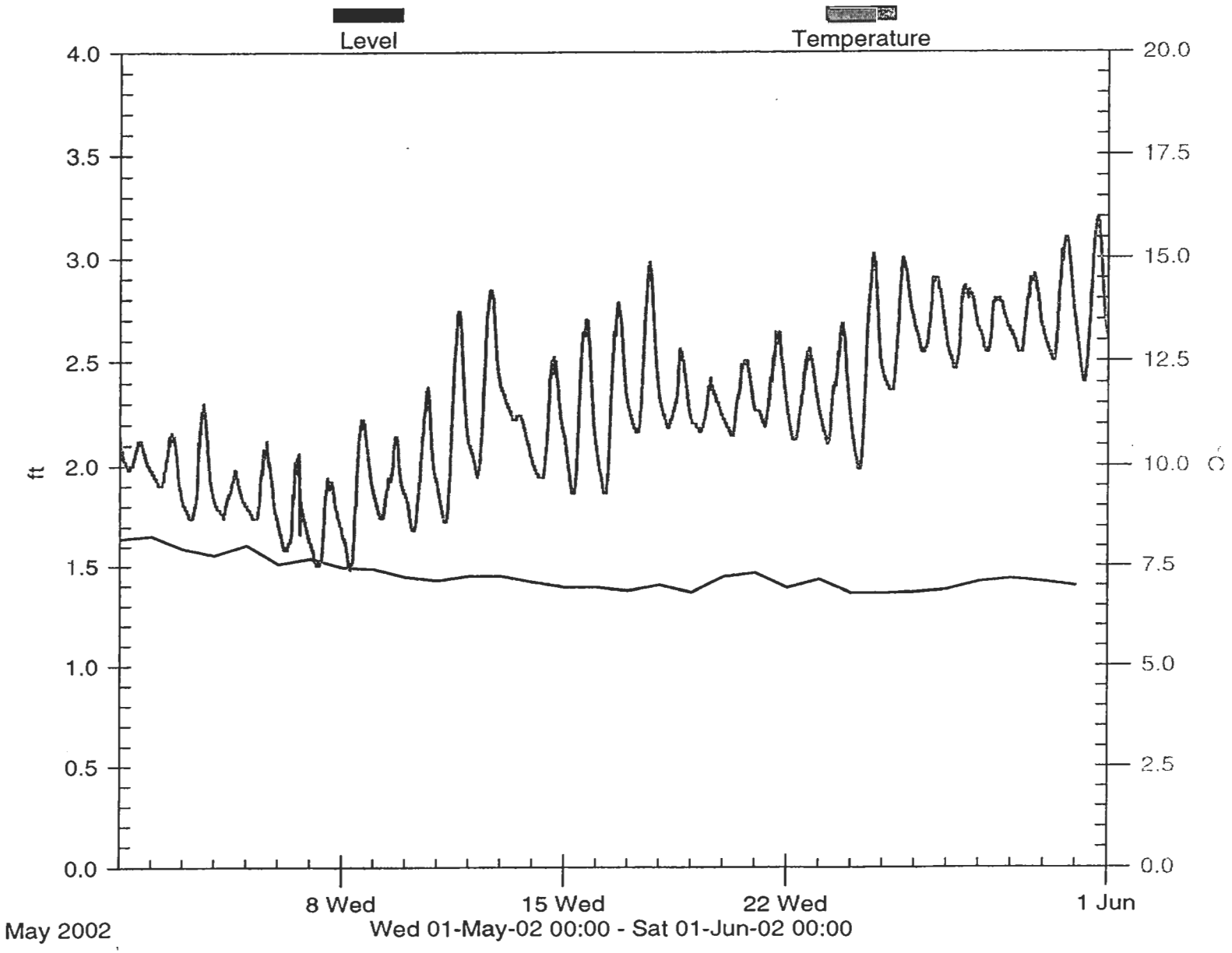


Site 3 - Horse Haven Creek




Site 3 - Horse Haven Creek
Level
Temperature
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
ft
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
C°
8 Mon
15 Mon
22 Mon
1 May
Apr 2002
Mon 01-Apr-02 00:00 - Thu 02-May-02 00:00

Site 3 - Horse Haven Creek



APPENDIX F

MID-PUYALLUP BASIN FISHERIES AND HABITAT CHARACTERIZATION

PART 1 – PRE-FIELD ASSESSMENT REPORT

Pierce County
Public Works and Utilities
Water Programs Division

Mid-Puyallup Basin Fisheries and Habitat Characterization

Part 1 – Pre-Field Assessment Report

September 2001

ENTRANCO

Part 1 – Pre-Field Assessment Report

MID-PUYALLUP BASIN FISHERIES AND HABITAT CHARACTERIZATION

Pierce County, Washington

Prepared for

Pierce County Public Works and Utilities
Water Programs Division

Prepared by

Patrick C. Trotter
Fishery Science Consultant

and

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10900 NE 8th Street, Suite 300
Bellevue, Washington 98004
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September 2001

INTRODUCTION

Pierce County Public Works and Utilities, Water Programs Division, has begun a basin-based planning process to identify and prioritize its projects and other activities. The Water Programs Division is responsible for surface water management in the unincorporated areas of Pierce County.

The intent of the Basin Planning Process is to provide an update of the Pierce County storm drainage and surface water management plan adopted by the County in 1991 (**Montgomery 1991**). Information regarding water management issues such as flooding, water quality and quantity, and fisheries resources will be collected and evaluated to determine the most effective means of protecting resources and preventing damage to public and private properties. A three-phase approach is being used to prepare these Basin Plans: (1) basin characterization, (2) basin planning, and 3) implementation. This report is a contribution to the Phase 1 effort for the Mid-Puyallup Basin.

The Mid-Puyallup Basin extends upstream along the Puyallup River from approximately river mile (RM) 7 below Puyallup to approximately RM 26.5 upstream of Orting, not including the Carbon River and Stuck River drainages. Specifically, we were asked to address six tributaries in this basin, but to exclude the mainstem Puyallup itself. The six included tributaries are:

- Unnamed tributary 0399, confluence at Puyallup RM 12.2;
- Unnamed tributary 0400, confluence at Puyallup RM 13.1;
- Ball Creek, tributary 0405, confluence at Puyallup RM 14.9;
- Fennel Creek, tributary 0406, confluence at Puyallup RM 15.5;
- Canyonfalls Creek, tributary 0410, confluence at Puyallup RM 16.2;
- Horse Haven Creek, tributary 0589, confluence at Puyallup RM 20.2.

This report presents results of a pre-field fisheries and fish habitat assessment of these six tributaries.

METHODS

Tri-County Urban Issues ESA Protocol

The Scope of Work for this project mandated that we evaluate baseline habitat conditions in the six included tributaries using the protocol set forth in the Tri-County Urban Issues ESA Study (**R2 Consultants et al. 2000**). Chapter 5 of the referenced study provides details of the protocol, which uses a two-phased approach to characterize baseline habitat conditions based

on geomorphic suitability, fish distribution, and man-caused habitat alterations. Phase I is essentially a desktop exercise to pre-classify habitat into reaches suitable for use by fish, reaches unlikely to be suitable for use, and reaches requiring a "second look" to determine suitability, i.e., closer examination in the field which is done in Phase II. In the Tri-County protocol, the emphasis is on salmon species, in particular those listed or candidates for listing under the U. S. Endangered Species Act (ESA) which includes all Puget Sound stocks of chinook salmon and bull trout (listed as threatened) and all Puget Sound stocks of coho salmon (candidates for listing). However, because State land use regulations also take account of fish bearing waters utilized by any species, and county land use regulations generally mirror State regulations, we also incorporated State stream typing guidelines into our assessment.

Phase I of the Tri-County protocol uses information from existing sources including other reports and studies, existing databases, topographic maps, GIS coverages, aerial photos, and the like. Some field reconnaissance of a "spot-check" nature may also be done in Phase I. Phase II is a more detailed field assessment of the reaches designated in Phase I as requiring the "second look." Phase II uses a suite of standard field methods to measure habitat quality and quantity. The output of this two-phased assessment is a classification of each site as Good, Fair, or Poor habitat for fish. This is similar to, and consistent with, the National Marine Fisheries Service (NMFS) Properly Functioning Condition Matrix for ESA-listed and candidate species (**NMFS 1996**).

Application of Phase I Methodologies

We used 1:24,000 topographic maps (specifically the USGS Sumner, Orting, and Buckley quadrangles) as well as the corresponding WDFW/WDNR hydrolayers to define the channel networks of each of the six tributaries. We subdivided each stream into segments using segment breaks and attributes provided by the joint State/Treaty Tribes Salmon and Steelhead Habitat Inventory and Assessment Program (SSHIAP). SSHIAP uses the method of Pleus and Schuett-Hames (**1998**) to divide the streams into logical segments based on gradient and confinement. Segment breaks were recorded on our 1:24,000 working maps and were assigned unique identifying numbers as listed in the SSHIAP database. We also obtained segment lengths, gradients, and confinement classes for these segments from the SSHIAP database. For some stream segments, we calculated sinuosity (the ratio of channel length to valley length) from map wheel measurements made directly from the working maps.

To identify channel type in each segment, we used the channel classification system of Paustian et al. (1992) which the Tri-County protocol recommends (**R2 Consultants et al. 2000**). This classification system categorizes channels into specific fluvial process types. Seven of these channel types are commonly found in the Tri-County region and are listed below with brief descriptions:

- **Palustrine**—Wetland channels, beaver pond complexes or sloughs. Velocity generally low, substrate composed of fine sediment or organic matter, channel morphology sinuous or irregular and dominated by pools or glides.

- **Floodplain**—Low gradient depositional channels. Substrate typically small gravel to cobble in size, bedform typically regularly spaced pool-riffles. LWD important for forming pools and providing cover. These channels migrate freely across alluvial floodplains, off-channel habitats are normally abundant.

- **Alluvial fan**—Moderate gradient depositional channels in the transitional area between steep slopes and valley floodplains. Stream power decreases longitudinally down the fan, and deposition results in channels that migrate across the fan. Gravel to cobble-size substrates, pools often small and shallow, off-channel habitats do not persist over the long term.

- **Large contained**—Low to moderate gradient channels that arte moderately to deeply incised. Stream power moderate to high with coarse substrates. LWD is easily transported and is generally found along channel margins. Off-channel habitats are rare.

- **Moderate gradient mixed control**—Transport dominated channels with moderate to high stream power. LWD is important for forming pools and storing sediment; substrates and bedforms are variable. Off-channel habitats may be present but are generally not abundant.

- **Moderate gradient contained**—Transport dominated channels with moderate to high stream power. LWD is important for forming pools and storing sediment; substrates and bedforms are variable. Off-channel habitats are rare.

- **High gradient contained**—Moderately to deeply incised channels with high stream power. Most sediments are easily transported, thus gravels and small cobbles are found only in hydraulically protected areas. Pools tend to be small and shallow, although LWD and bedrock may form large deep pools.

The authors of the Tri-County protocol (**R2 Consultants et al. 2000**) suggest that channel types delineated as above can be used to predict use of habitat by salmonid fish species, and they provide a table that ranks species-specific habitat use by channel type into high-use, secondary-use, and negligible-use categories. However, since we already had actual stream type and fish distribution data for many of the stream segments from other sources, we did not rely on this portion of the methodology.

We extracted a limited amount of useful habitat quality and quantity information about stream segments in Fennel, Canyonfalls, and Horse Haven creeks from previous studies by AES and Beak (**1997**), Huckell/Weinman (**1998**), Foster Wheeler (**1999**), and Thorpe and Stepan (**1985**). Fish bearing and non-fish bearing water type and fish distribution information was taken from WDFW/WDNR hydrolayers, Tri-County StreamNet maps, WDFW and Puyallup Tribal Fisheries unpublished sources, and Williams et al. (**1975**). This was overlayed on the working maps to envision fish distribution and water type by stream segment.

Next we assessed the extent of man-caused channel alterations using information extracted from the AES and Beak (**1997**), Huckell/Weinman (**1998**), Foster Wheeler (**1999**), and Thorpe and Stepan (**1985**) studies, as well as from GIS coverages provided by Pierce County for road crossings, sewer lines, pump stations, waster water treatment plants, drainage ponds, land use designations, and open space corridors. We also incorporated culvert locations and barrier information from the Pierce Conservation District's recent inventory of culverts and barriers to fish passage (**Pierce Conservation District 2000**). No information was available from Pierce County for total impervious area (TIA), so we estimated TIA values for each stream segment using the GIS coverage for land use designation and rules-of-thumb values for TIA of different kinds of land uses published by May et al. (**1997**) for Puget Sound lowland streams. Finally, the Washington State 303(d) list for 1998 (the most recent available) was consulted for water quality problem areas in the six tributary basins. This information was combined and used to rank the level of channel alteration as High, Moderate, or Low according to the criteria set forth in Table 1 (**R2 Consultants et al. 2000**).

Table 1
Level of Channel Alteration

	Two or more of the following High	**One or more of the following Moderate**	**All of the following Low**
TIA	> 40%	40–10%	< 10%
Channel & flow modifications	> 50%	25–50%	< 25%
Riparian breaks	> 5 per mile	2–5 per mile	< 2 per mile
303(d) listings	More than one	One	None

To complete the desktop assessment, a "Phase I Decision Box" (**R2 Consultants et al. 2000**) was constructed for each tributary. A "Decision Box" is essentially a matrix of expected fish use (or, where known, actual fish use) against level of man-caused channel alteration. These "Decision Boxes" pre-classify stream segments into Highly Suitable, Questionable or Secondary Use, and Negligible Use categories (**R2 Consultants et al. 2000**). Segments falling into the Questionable or Secondary Use category are those requiring a "second look" in the field and will be evaluated during the Phase II field work to finalize their habitat condition assessment based on standard field methods.

RESULTS

Descriptions of each tributary together with a running compilation of all of its pre-field assessment information are provided in Appendix A of this report.

Stream 0399

General Description

Stream 0399 is something of a "mystery" stream. It is cataloged and mapped in the State Water Resource Inventory Area (WRIA) catalog and in Williams et al. (**1975**) as a perennial stream, total length 1.8 miles, possibly used by coho. It is also mapped on the WDNR/WDFW hydrolayer as a perennial stream and is typed as fish bearing water. As mapped by these sources, it would have arisen on the valley floor at about the intersection of 102nd St. E. and SR-162 south of Alderton, and flowed north to join the Puyallup River just west of the corner of 80th St. E. and SR-162 at about Puyallup RM 12.2. It would have drained open fields and farmlands which are now gradually being converted to residential housing (the Pierce County Land-Use GIS coverage indicates a mix of properties zoned "Agricultural" and "Rural Five"). The overall gradient of the valley floor is < 1% and the channel would have been classified as unconfined.

However, this stream is not shown on the USGS 1:24,000 Sumner quadrangle map dated 1993. Furthermore, during field reconnaissance performed on February 8, 2001, we could not locate anything other than occasional indicators that an open stream channel may have once existed at the mapped location. The channel has been filled or placed underground for virtually all of its length.

We conclude that Stream 0399 no longer exists as an open water channel connecting to the Puyallup River, and certainly there can be no present fish use. Therefore, we did not prepare a Decision Box for this stream. A formal stream type change will be submitted to DNR to reclassify this stream as Type 5 (non-fish bearing) water.

Stream 0400

General Description

Stream 0400 originates on the valley floor south of 92nd St. E. and flows north along the base of the bluff west of Bonney Lake before looping west to Riverside Park where it passes under Riverside Drive and is joined by Tributary 0401. It turns north at this juncture but swings west again within a moderately confined channel (steep bank on its east and north side) to its confluence with Puyallup River at RM 13.1 in Township 20 N, Range 5 E, section 30. Stream length is given as 2.15 miles in Williams et al. (**1975**) but is 1.9 miles based on summation of WDNR/WDFW hydrolayer segment lengths. Stream substrate is fine sediment and organic

matter where observed in segment 16/8//1. The channel is sloughlike at this point, and the water was quite murky on the day of reconnaissance (February 8, 2001).

This stream and its tributary system upstream of Riverside Drive drains a mixed-use agricultural, residential housing area (the Pierce County Land-Use GIS coverage indicates a mix of properties zoned “Agricultural” and “Rural Five,” although the housing density appeared to be considerably greater than this along Riverside Drive).

Level of Channel Alteration

Because we already had information from WDNR/WDFW hydrolayer and Streamnet maps that Stream 0400 is Type 4 (non-fish bearing) water for its entire length, and our brief field reconnaissance supported that information, we gave all segments a default channel alteration ranking of High.

Phase I Decision Box

The Phase 1 Decision Box for Stream 0400 stream segments is shown in **table 2** below:

Table 2
Phase 1 Decision Box for Stream 0400

Channel Alteration	Fish Use Suitable	Fish Use Questionable	Fish Use Negligible
Low			
Moderate			
High			16/8//1
			16/8//2
			16/8//3
			16/8//4
			16/8/1//1

Ball Creek, Stream 0405

General Description

Ball Creek is another valley floor tributary originating south of Old Military Road at the base of the bluff that forms the Puyallup Valley west wall. This stream flows diagonally northeast across the valley floor, crosses SR-162 and 106th St. E., and continues to its confluence with the Puyallup River at Puyallup RM 14.9 in Township 19 N, Range 5 E, section 6. Stream length given in Williams et al. (**1975**) as 1.35 miles, but summation of SSHIAP segment lengths gives 1.7 miles. Ball Creek flows through land alternately used for agriculture and residential housing.

Level of Channel Alteration

Results of the pre-field analysis of channel alteration and resultant rankings of stream segments for Ball Creek are summarized in **table 3** below.

Table 3
Ranking of Ball Creek Channel Segments for Level of Alteration

	16/10//1	**16/10//2**	**16/10//3**
TIA	< 10%	10–40%	10%
Channel & flow modifications	< 25%	25-50%	< 25%
Riparian breaks	> 5	> 5	> 5
303(d) listings	0	0	0
Rank	M	M	M

Phase I Decision Box

The Phase 1 Decision Box for stream segments in Ball Creek is shown in Table 4 below.

Table 4
Phase 1 Decision Box for Ball Creek

Channel Alteration	Fish Use Suitable	Fish Use Questionable	Fish Use Negligible
Low			
Moderate		16/10//1	
		16/10//2	
		16/10//3	
High			

Fennel Creek, Stream 0406

General Description

Fennel Creek originates on the old Osceola mud flow near the north side of SR-410 east of intersection with 233rd [or 234th] St. E. The stream flows generally west toward the City of Bonney Lake, then turns south and flows through an old Vashon-age meltwater drainage channel that also was filled by a lobe of the Osceola mud flow (**Crandell 1963**) to Victor Falls, RM 2, where the course alters to the west through a steep canyon to the Puyallup Valley floor at McCutcheon Road, RM 0.4. There the stream flattens and turns north to flow across the valley floor to its confluence with the Puyallup River at Puyallup RM 15.5 in Township 19 N, Range 5 E, SE corner of SE corner of section 6. The stream has also been known as Kelly Creek. Stream length is given as 7.95 miles and drainage area as 6.58 sq. mi. in Williams et al. (**1975**).

Fennel Creek drains a mixed use area of agriculture, rural, suburban and urban housing, plus some light industry. Much new housing development is occurring in the valley area and some within the canyon south of the City of Bonney Lake. A large gravel quarry (Maranatha Gravel) is located at the face of bluff that forms the south valley wall of Fennel Creek just upstream from McCutcheon Road, approximately RM 0.5.

Near the Fennel Creek headwaters along Old Sumner-Buckley Highway, RM approximately 5.4–6.2, the stream parallels the roadway quite closely and flooding problems from stormwater flow occur. See Foster Wheeler (**1999**) for details of proposed solutions. Foster Wheeler (**1999**) has produced an environmental analysis of the entire Fennel Creek corridor for the City of Bonney Lake.

Level of Channel Alteration

Results of the pre-field analysis of channel alteration and resultant rankings of stream segments for Fennel Creek are summarized in **table 5** below:

Table 5
Level of Channel Alteration, Fennel Creek Stream Segments

	11//1	11//2	11//3	11//4	11//5	11//6	11//7	11//8	11//9	11//10	11//11	11//12	11//13
TIA	<10%	<10%	<10%	<10%	<10%	10-40%	10-40%	<10%	10-40%	10-40%	10-40%	10-40%	10-40%
Channel & flow modification	<25%	<25%	<25%	<25%	25-50%	25-50%	25-50%	25-50%	>50%	<25%	<25%	NA	NA
Riparian breaks													
303(d)	0	0	0	0	0	0	0	0	0	0	0		0
Rank	L	L	L	L	L	M	M	M	H	M	M	M	M

Phase I Decision Box

The Phase 1 Decision Box for stream segments in Fennel Creek is shown in **table 6** below.

Table 6
Phase 1 Decision Box for Fennel Creek

Channel Alteration	Fish Use Suitable	Fish Use Questionable	Fish Use Negligible
Low	16/11//1		16/11//5
	16/11//2		
	16/11//3		
	16/11//4		
Moderate		16/11//6	16/11//11
		16/11//7	16/11//12
		16/11//8	16/11//13
		16/11//10	
High		16/11//9	

Canyonfalls Creek, Stream 0410

General Description

Canyonfalls Creek heads in wetlands in a geological depression on the border between sections 8 and 9 of Township 19N, Range 5E, approximately 0.5 mi. south of Victor Falls on Fennel Creek. However, there may not be an open channel here; AES and Beck (**1997**) reported only a series of wetlands extending downstream around a "fish hook bend" to the west as far as RM 1.8 where the first surface water "daylights." From there the stream flows just north of west to the Troutlodge Hatchery at about RM 1.0 where the hatchery water intake (water right for 15 cfs) dries the channel. Return water from the hatchery reenters the stream at RM 0.86. The stream then drops through a steep ravine (gradient 17-18 percent) to McCutcheon Road, RM 0.55, where the gradient flattens and the stream turns north to join the Puyallup River at Puyallup RM 16.2 in Township 19 N, Range 5 E, n half of section 7. Stream length is listed as 3.0 miles and drainage area as 1.71 sq. mi. in Williams et al. (**1975**); however, Huckell/Weinman (**1998**) record the total drainage area as 3.8 sq. mi.

The headwaters of Canyonfalls Creek are undeveloped and forested down to the Troutlodge Hatchery. However, the Cascadia Planned Community development is planned for the uplands south of Canyonfalls Creek (**Huckell/Weinman 1998**) and a golf course development may be built on the uplands north of the creek, i.e., between Canyonfalls and Fennel creeks (**Subdivision Development and Design et al. 1996**). Land use downstream of McCutcheon Road appears to be agricultural and sparse residential.

Level of Channel Alteration

Results of the pre-field analysis of channel alteration and resultant rankings of stream segments for Canyonfalls Creek are summarized in **table 7** below:

Table 7
Ranking of Canyonfalls Creek Channel Segments for Level of Alteration

	16/12//1	16/12//2	16/12//3	16/12//4	16/12//5	16/12//6
TIA	<10%	<10%	<10%	>40%	<10%	<10%
Channel & flow modifications	< 25%	< 25%	< 25%	>50%	<25%	<25%
Riparian breaks	< 2	< 2	< 2	> 5	< 2	< 2
303(d) listings	0	0	0	0	0	0
Rank	L	L	L	H	L	L

Phase I Decision Box

The Phase 1 Decision Box for stream segments in Canyonfalls Creek is shown in **table 8** below:

Table 8
Phase 1 Decision Box for Canyonfalls Creek

Channel Alteration	Fish Use Suitable	Fish Use Questionable	Fish Use Negligible
Low	16/12//1	16/12//2	16/12//3
		16/12//5	16/12//6
Moderate			
High			16/12//4

Horse Haven Creek, Stream 0589 (and tributaries 0590, 0591, 0592 and 0593)

General Description

Several different names are associated with this stream and its tributaries. We follow the convention given in Williams et al. (**1975**), which is also used on the WDFW/WDNR hydrolayer and by SSHIAP.

The Horse Haven mainstem (called Soldiers Home Creek in Thorpe and Stepan 1985) heads at a small 1 to 1.4 acre pond, el. ~440 ft, in Township 18N, Range 5E, section 6, southwest of the Orting Soldiers Home. It drains west then north through a steep gully with an impassable cascade, and emerges on the valley floor near the Soldiers Home where it is joined by tribs 0592 and 0593. The stream becomes a valley tributary at this point, flowing northwest along the base of the bluff for approximately 2 miles to its confluence with Tributary 0590 (called Lorraine Creek by Pierce Conservation District 2000 but considered the mainstem of Horse Haven Creek by Thorpe and Stepan 1985). Tributary 0590 itself originates at a ~10 acre pond, el ~450 ft., in Township 19N, Range 4E, SW 1/4 of SW 1/4 section. 36, then flows west down a steep ravine with an impassable cascade to the valley floor where it turns north to join the mainstem. Horse Haven then continues north-northwest to join the Puyallup River at Puyallup RM 20.2 in Township 19 N, Range 4 E, n half of section 25. Horse Haven mainstem stream length is given as 3.3 miles and Tributary 0590 stream length as 1.4 miles in Williams et al. (**1975**). Tributaries 0591, 0592, and 0593 are also mapped in Williams et al. (**1975**) but no stream lengths are given.

The gullies of both the mainstem and Tributary 0590 appear inaccessible and forested (based on the USGS Orting quad revised 1994). However, the headwaters of Tributary 0590 are located in an area designated Master Planned Community on the Pierce County land use map and are within the boundary of the Rainier Terrace Planned Community development (**Thorpe**

and Stepan 1985). The valley floor is a mixed use area of homes and agriculture. The Puyallup Tribe once considered building a fish hatchery along upper Horse Haven Creek but abandoned the plan due to the ephemeral nature of streamflow in the late summer months (**R. Ladley, Puyallup Tribe, personal communication March 19, 2001**).

Level of Channel Alteration

Results of the pre-field analysis of channel alteration and resultant rankings of stream segments for Horse Haven Creek are summarized in Table 9 below:

Table 9
Level of Channel Alteration, Horse Haven Creek Stream Segments

	20//1	20//2	20//3	20//4	20//5	20//6	20//7	20//8	20//9	20//10	20//11	20//12	20/2//1
TIA	10-40%	10-40%	10-40%	10-40%	<10%	<10%	10-40%	10-40%	10-40%	10-40%	10-40%	10-40%	10-40%
Channel & Flow modification	<25%	25-50%	<25%	25-50%	<25%	<25%	<25%	<25%	<25%	<25%	<25%	<25	<25
Riparian breaks	1	3	2	5	0	0	0	0	0	0	0	0	2
303(d)	0	0	0	0	0	0	0	0	0	0	0		0
Rank	M	M	M	M	L	L	L	L	L	L	L	L	M

Phase I Decision Box

The Phase 1 Decision Box for stream segments in Horse Haven Creek is shown in **table 10** below:

Table 10
Phase 1 Decision Box for Horse Haven Creek

Channel Alteration	Fish Use Suitable	Fish Use Questionable	Fish Use Negligible
Low		16/20//5	16/20//9
		16/20//6	16/20//10
		16/20//7	16/20//11
		16/20//8	16/20//12
Moderate		16/20//1	
		16/20//2	
		16/20//3	
		16/20//4	
		16/20/2//1	
High			

CONCLUSIONS AND RECOMMENDATIONS

This pre-field assessment supports the following conclusions:

1. Fennel Creek stream segments 16/11//1 through 16/11//4 and Canyonfalls stream segment 16/12//1 rank as suitable habitat for fish use. Indeed, this conclusion was fore-ordained, since it is already well known that these stream segments support important runs of anadromous salmonids. The best-known of these are the chum salmon runs to both creeks which may be the strongest in the entire Puyallup River basin. But perhaps of greater importance from a regulatory and land-use restriction point of view, Fennel Creek also supports a small but persistent return of chinook salmon, listed as threatened under the ESA, as well as coho salmon which are a candidate for listing under the ESA. Contrary to some reports, chinook salmon have <u>not</u> been found in Canyonfalls Creek, but this stream segment does support candidate coho salmon.

2. The following stream segments are in questionable condition for fish use:

Ball Creek	Fennel Creek	Canyonfalls Creek	Horse Haven Creek
16/10//1	16/11//6	16/12//2	16/20//1
16/10//2	16/11//7	16/12//5	16/20//2
16/10//3	16/11//8		16/20//3
	16/11//9		16/20//4
	16/11//10		16/20//5
			16/20//6
			16/20//7
			16/20//8
			16/20/2//1

We recommend that segments 16/10//1 through 16/10//3 of Ball Creek, segments 16/11//6 through 16/11//9 of Fennel Creek, segment 16/12//5 of Canyonfalls Creek, and segments 16/20//1, 16/20//2 and 16/20/2//1 of the Horse Haven Creek system be examined in greater detail in Phase 2 of this project to ascertain their proper ranking.

Phase 2 will involve two separate field excursions. The physical habitat and fish use components of the Tri-County protocol should be carried out during the month of June. However, collections for determining benthic index of biotic integrity (BIBI) for the four streams must be done during the month of September. Therefore, Phase 2 will be two-pronged—physical habitat and fish use assessment in June, and BIBI collections in September.

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APPENDIX A

Stream Characterization, Pre-Field Running Summary

STREAM 0399

General Description

Confluence with Puyallup River at Puyallup RM 12.2; T 20 N, R 4 E, NE corner of NE corner sec. 36.

This is something of a "mystery" stream, in that:

- It is cataloged and mapped in the State Water Resource Inventory Area (WRIA) catalog and in Williams et al. (**1975**) as a perennial stream, total length 1.8 miles, possibly used by coho.

- It is mapped on the WDNR/WDFW hydrolayer as a perennial stream and is typed as fish bearing water (coho use extending upstream for 0.7 mile assumed by the WRIA 10 EDT Project–in progress 2001). However, the stream typing information shown on the WDNR/WDFW hydrolayer is pre-1995 from an unknown source and WDNR does not vouch for its accuracy (**Kevin Smith, WDNR Enumclaw, 2/7/01**).

- It is not shown on the USGS 1:24,000 Sumner quadrangle map dated 1993.

- During field reconnaissance (**PCT and E. Adams, Entranco, 2/8/01**) we could not locate anything other than occasional indicators that an open stream channel may have once existed at the mapped location. The channel has been filled or placed underground for virtually all of its length. A drainage swale does exist from the crossing of Pioneer Way north to within about 100 ft. of 80th St. E., but there it enters an underground pipe that carries it under 80th St. E., under a residential lot on the south side with a house built on it, and through the levee to the Puyallup River.

In its prior state, as mapped by Williams et al (**1975**) and on the WDNR/WDFW hydrolayer, it would have arisen on the valley floor at about the intersection of 102nd St. E. and SR-162 south of Alderton, and flowed north to the Puyallup River just west of the corner of 80th St. E. and SR-162 at about Puyallup RM 12.2. It would have drained open fields and farmlands which are now gradually being converted to residential housing (the Pierce County Land-Use GIS coverage indicates a mix of properties zoned "Agricultural" and "Rural Five"). The overall gradient of the valley floor is < 1% and the channel would have been classified as unconfined. Based on the 100-year floodplain map in Montgomery (**1991**), the Puyallup River left-bank levee protects all of the 0399 basin area from flood events of this magnitude.

We conclude that this stream no longer exists as an open water channel connecting to the Puyallup River, and certainly there can be no present fish use. A formal stream type change will be submitted to DNR.

STREAM 0400

General Description

- Confluence with Puyallup River at Puyallup RM 13.1; T 20 N, R 5 E, sec 30.
- Stream length 2.15 miles (**Williams et al. 1975**); 1.9 miles based on summation of WDNR/WDFW hydrolayer segment lengths.
- Originates on the valley floor south of 92nd St. E.; flows north along the base of the bluff west of Bonney Lake, then loops west to Riverside Park where it passes under Riverside Drive and is joined by Tributary 0401. It turns north at this juncture but loops to the west in a moderately confined channel (steep bank on its east and north side) to its confluence with Puyallup River at RM 13.1.
- This stream and its tributary system upstream of Riverside Drive drains a mixed-use agricultural, residential housing area (the Pierce County Land-Use GIS coverage indicates a mix of properties zoned "Agricultural" and "Rural Five," although the housing density appeared to be considerably greater than this along Riverside Drive).
- Substrate fine sediment and organic matter where observed (in segment 16/8//1); channel slough like; water quite murky on day of reconnaissance (**PCT and E. Adams, Entranco, 2/8/01**).

Stream Segments and Attributes

Segment attributes from SSHIAP based on WDNR/WDFW hydrolayer. In the chart below, segment 16/8/1//1 is Tributary 0401.

Segment	Length, ft.	Habitat Class	Gradient/Confinement
16/8//1	1600	1 (small trib)	<1% unconfined
16/8//2	3400	1 (small trib)	<1% unconfined
16/8//3	3000	1 (small trib)	<1% unconfined
16/8//4	3000	1 (small trib)	<1% unconfined
16/8/1//1	1000	4 (slough)	<1% unconfined

Stream Habitat Survey

- No information available.

Fish Utilization Information

- Williams et al. (**1975**) cataloged as possibly used by coho and chum salmon.
- WDNR/WDFW hydrolayer types as Type 4 (non-fish bearing) water in segments 16/8//1, 16/8//2 and 16/8//3, also segment 16/8/1//1 (Tributary 0401). Type 5 or 9 water in upper reaches, segment 16/8//4.

Stream Flow/Hydrology

- Segment 16/8//1, the lower fourth of segment 16/8//2, and all of segment 16/8/1//1 (Tributary 0401) are within the Puyallup River 100-year floodplain (**Montgomery 1991**).

Total Impervious Area (TIA)

- This stream and its tributary system upstream of Riverside Drive drains a mix of agricultural and residential land uses zoned “Agricultural” and “Rural Five” according to the Pierce County Land-Use GIS coverage. Based on these land uses, estimated TIA is 7.5 percent (**May et al. 1997**).

Channel and Flow Modifications

- Not assessed.

Riparian Condition/Riparian Breaks

- Not assessed.

Water Quality/Section 303(d) Listings

- None.

BALL CREEK, STREAM 0405

General Description

- Confluence with Puyallup River at Puyallup RM 14.9; T 19 N, R 5 E, sec 6.
- Ball Creek is the name used by Pierce Conservation District (**2000**), the Puyallup Tribe, and WDFW.
- Another valley floor tributary; originates on valley floor south of Old Military Road at the base of the bluff that forms the Puyallup Valley west wall. Flows diagonally northeast across the valley floor; crosses SR-162 and 106th St. E. to confluence with Puyallup River at Puyallup RM 14.9.
- Stream length given in Williams et al. (**1975**) as 1.35 miles; summation of SSHIAP segment lengths gives 1.7 miles.
- Flows through land alternately used for agriculture and residential housing.

Stream Segments and Attributes

Segment attributes from SSHIAP based on WDNR/WDFW hydrolayer.

Segment	Length, ft.	Habitat Class	Gradient/Confinement
16/10//1	2600	1 (small trib)	2-4% unconfined
16/10//2	4000	1 (small trib)	<1% unconfined
16/10//3	2200	1 (small trib)	<1% unconfined

Stream Habitat Survey

- Stream reach at upper end of segment 16/10//2 (approximately 1200-1300 ft of stream along railroad track) appears from the map to be channelized.
- Large duck ponds and private beautification projects constructed where stream flows through private property at 106th St. E. (**PCT and E. Adams, Entranco, field reconnaissance 2/8/2001**).

Fish Utilization Information

- Williams et al. (**1975**) cataloged as fish use unknown.
- Used for spawning and rearing by coho (**R. Ladley, Puyallup Tribe, personal communication 3/19/2001**); by coho and cutthroat trout (**D. Nauer, WDFW personal communication 3/19/2001**).
- WDNR/WDFW hydrolayer maps as fish bearing water (Type 2 or 3) to just upstream of Old Military Road (segment 16/10//3).
- WRIA-10 EDT Project (in progress, 2001) lists “known coho distribution to RM 1.2” which would be near the crossing of Old Military Road (segment 16/10//3).
- Present upstream extent of anadromous/migratory fish use is RM 0.4-0.5 (upper bound of segment 16/10//1) due to blocking culverts.

Stream Flow/Hydrology

- Lowermost fifth of segment 16/10//1 is within the Puyallup River 100-year floodplain (**Montgomery 1991**).

Total Impervious Area (TIA)

- Segment 16/10//1, lowermost half, flows through land zoned “Agricultural,” estimated TIA 5 percent (**May et al. 1997**). Upper half, land use zoned “rural Five,” estimated TIA 10 percent (**May et al. 1997**).
- Segment 16/10//2 zoned “Rural Five, estimated TIA 10 percent (**May etal. 1997**).
- Segment 16/10//3 zoned ”Rural Five” in lower half, estimated TIA 10 percent; upper half zoned “Agricultural,” estimated TIA 5 percent (**May et al. 1997**).

Channel and Flow Modifications

- Large duck ponds and private beautification projects constructed where stream flows through private property at 106th St. E. (**PCT and E. Adams, Entranco, field reconnaissance 2/8/2001**).
- Stream reach at upper end of segment 16/10//2 (approximately 1200-1300 ft of stream along railroad track) appears from the map to be channelized.

Culvert/Barrier Analysis

- Pierce Conservation District (**2000**) mapped impassable culverts under a driveway near 106th St. E. and under 106th St. E. itself (RM 0.4-0.5; near upper bound of segment 16/10//1); another nearby driveway culvert is mapped as questionable for passage.
- Culvert under SR-162 (RM 0.7; segment 16/10//2) impassable. Culvert under railroad track at RM 0.9 (upper bound of segment 16/10//2) impassable.
- Culvert under Old Military Road (segment 16/10//3) mapped as questionable for passage.

Riparian Condition/Riparian Breaks

- Riparian vegetation (deciduous) present along some reaches, open exposure in others.
- Large duck ponds and private beautification projects constructed where stream flows through private property at 106th St. E. (**PCT and E. Adams, Entranco, field reconnaissance 2/8/2001**).
- Total stream crossings (roads, driveways, fords, railroad tracks and the like) 10; i.e., 5.9 crossings per mile of stream using SSHIAP stream length.

Water Quality/Section 303(d) Listings

- None.

FENNEL CREEK, STREAM 0406

General Description

- Confluence with Puyallup River at Puyallup RM 15.5; T 19 N, R 5 E, SE corner of SE corner sec 6.
- Also known as Kelly Creek.
- Stream length 7.95 miles; drainage area 6.58 sq. mi. (**Williams et al. 1975**).
- Originates on the old Osceola mud flow near the north side of SR-410 east of intersection with 233rd [or 234th] St. E. Flows generally west toward City of Bonney Lake, then turns south and flows through an old Vashon-age meltwater drainage channel that also was filled by a lobe of the Osceola mud flow (**Crandell 1963**) to Victor Falls, RM 2, where the course alters to the west through a steep canyon to the Puyallup

Valley floor at McCutcheon Road, RM 0.4. There the stream flattens and turns north to flow across the valley floor to its confluence with the Puyallup River at Puyallup RM 15.5.

- Drains a mixed use area of agriculture, rural, suburban and urban housing, and some light industry. Much new housing development occurring in the Fennel valley area near the City of Bonney Lake.

- Large gravel quarry (Maranatha Gravel) digging into face of bluff that forms the south valley wall of Fennel Creek just upstream from McCutcheon Road, approximately RM 0.5.

- Near headwaters, along Old Sumner-Buckley Highway, RM approximately 5.4–6.2, the stream parallels the roadway quite closely and flooding problems from stormwater flow occur. See Foster Wheeler (**1999**) for details of proposed solutions.

- Foster Wheeler (**1999**) has produced an environmental analysis of the entire Fennel Creek corridor for City of Bonney Lake.

Stream Segments and Attributes

Segment attributes from SSHIAP based on WDNR/WDFW hydrolayer.

Segment	Length, ft.	Habitat Class	Gradient/Confinement
16/11//1	3200	1	1-2%, unconfined
16/11//2	4200	1	2-4%, confined
16/11//3	600	1	4-8%, confined
16/11//4	2000	1	2-4%, confined
16/11//5	500	1	> 20%, confined
16/11//6	2600	1	1-2%, unconfined
16/11//7	10,600	1	< 1%, unconfined
16/11//8	5000	1	< 1%, unconfined
16/11//9	3400	1	< 1%, unconfined
16/11//10	3800	1	< 1%, unconfined
16/11//11	1200	1	1-2%, unconfined
16/11//12	1200	1	2-4%, moderately confined
16/11//13	3600	1	1-2% unconfined

Stream Habitat Survey

Segment 16/11//1:

- Foster Wheeler (**1999**) spot-surveyed downstream from McCutcheon Road, approx. RM 0.3; classified habitat quality near McCitcheon Road as moderate, consisting essentially of a single long riffle with abundant clean gravel suitable for spawning, but no holding pools or LWD that fish could use for cover.

- Near confluence with Puyallup, habitat quality was rated moderate to good with abundant LWD (12 to 20-in. diam. deciduous); spawning gravels plentiful and clean; moderate level of shading.

- Contrast these Foster Wheeler (**1999**) observations with those following, reported by AES and Beck (**1997**):

- Mud substrate from mouth to RM 0.2.

- RM 0.2 to 0.3 (approximate location of McCutcheon Road bridge) mud with patches of gravel.

- RM 0.3 upstream to RM 0.6 (upper bound of segment) substrate dominated by gravel and cobble.

Segment 16/11//2:

- RM 0.6 to RM 1.7 substrate dominated by gravel and cobble (reported by AES and Beck 1997).

Segment 16/11//3:

- Foster Wheeler (**1999**) spot-surveyed 300 ft downstream of 119th Court E. crossing (approximate segment upper bound); reported good habitat conditions for anadromous and resident fish; high channel complexity owing to plentiful LWD (including many >20-in. red-cedar pieces).

- Pools present but not plentiful.

- Only moderate canopy closure but topographic shading occurs due to steep valley walls.

- Stream gradient 2.7%, wide bank full width (30 ft. in places). Abundant channel roughness elements (LWD, boulders, streambank vegetation).

Segments 16/11//3 and 16/11//4:

- RM 1.7 to RM 2.0. Foster Wheeler (**1999**) survey. Stream gradient increases and cobble & boulders become more dominant although gravel patches do occur.
- Few pools.
- Numerous pieces of LWD in channel.

Segment 16/11//5:

- This 500-ft. segment comprises Victor Falls. Foster Wheeler (**1999**) reported this falls to be 90 ft. high.

Segment 16/11//6:

- Foster Wheeler (**1999**) spot-survey.
- Reach includes moderate to good quality habitat but overall rated moderate. Favorable features included a scour pool, a complex island stabilized with LWD & grassy vegetation, and vegetation overhanging the stream. Negative features included a long, straight riffle, very little canopy closure and high embeddedness of the substrate.
- Little LWD in the channel.
- Several areas noted where the streambank has been trampled and caved in by livestock, but livestock has since been removed from this reach.

Segment 16/11//7:

- Spot-surveyed by Foster Wheeler (**1999**) up to SR-410, RM 3.8.
- Overall reach gradient reported by Foster Wheeler (**1999**) is 1.1%.
- Fish habitat rated moderate overall, but poorer in quality than in segment 16/11//6.
- Ample amount of gravel for spawning; relatively low embeddedness.
- No pool habitat except for one dam pool which was LWD-formed; otherwise little LWD in channel.
- Shading and some cover provided by bankside shrubs and occasional boulders in the channel.

Upper 16/11//7 and segment 16/11//8:

- Based on Foster Wheeler (**1999**) spot surveys from SR-410 upstream, overall habitat quality for salmonids judged poor (however, see Fish Utilization section for more info).
- Habitat is predominately glide habitat, mostly shallow; some riffles; few if any pools. Overall channel complexity low.
- Little if any LWD in channel.
- Substrate consists of gravels and cobbles, but substantial levels of silt and clay sediment as well.

Segment 16/11//9:

- Foster Wheeler (**1999**) surveyed this segment from roughly RM 5.4 to Rm 6.0.
- This segment is channelized close alongside Old Sumner Buckley Highway.
- No LWD in channel, no side channels, no undercut banks, no roughness elements in channel, low habitat complexity.
- Entire surveyed reach classified as run habitat. No pools or deep (.3 ft.) water.
- Substrate predominately pea-gravel, sand, and silt. However, embeddedness was judged to be low.
- Canopy closure and overhanging vegetation high, consequently the creek is shaded during warm months which helps to moderate water temperatures.

Fish Utilization Information

- WDFW/DNR hydrolayer maps Fennel Creek as fish bearing water to upper end of segment 16/11//11 (RM 7.0).
- Upstream extent of anadromous and migratory fish use is Victor Falls (RM 2.0), upper end of segment 16/11//5.
- Williams et al. (**1975**) cataloged use of lower 2 miles by coho and chum.
- Fennel Cr. chum stock considered a unique stock by State and tribes; even though Hood Canal chums were introduced, the present naturally spawning stock is genetically distinct from Hood Canal stock (**WDFW and WWTIT 1994**).

- Pink salmon also spawn in Fennel Creek in odd-numbered years.. (**WDFW and WWTIT 1994**).

- Chinook salmon (of the Puyallup River fall chinook stock) also use the stream but this is not considered a major spawning tributary for chinook (**WDFW and WWTIT 1994**).

- Winter steelhead use has also been recorded (see below) and sea-run cutthroat trout may use the stream but there is no information available on these.

- Bull trout are presumed present owing to proximity to sightings in mid-Puyallup River, but no actual documented occurrences in Fennel Creek are known (**J. Hunter, WDFW, personal communication 2/14/2001**).

- According to C. Baranski, WDFW (cited in Foster Wheeler 1999), chum, pink, and chinook salmon spawn only up to RM 1.1 (segment 16/11//1 and a portion of segment 16/11//2), whereas most of the coho spawning occurs between RM 1.1 and 1.9 (segments 16/11//2, 16/11//3, and 16/11//4).

- Summary of spawning data compiled by WDFW and Puyallup Indian Nation; cited in AES and Beck (**1997**):

	Spawning Season	Period of Record	Mean Peak Density Fish/mile
Chum	Dec-Jan	1971-1996	327.7
Coho	Oct-Jan	1970-1996	33.2
Winter steelhead	Dec-Jan	1984, 1987, 1995	2.2
Pink (odd years only)	Sept-Oct	1981, 1985, 1989, 1995	0.8
Chinook	Sept-Oct	1970, 1975	0.7

- At the mean peak density of 327.7 fish/mile, this is one of the largest (if not the largest) chum runs in the Puyallup basin; it is close to 10X higher than all the other salmonid species combined.

- Although considered by most standards to be too small and flows too low for large-bodied fish like chinook salmon, a few chinook are observed from time to time spawning in Fennel Creek.

- Resident cutthroat trout are found upstream of Victor Falls, as far upstream as the last crossing of the Sumner-Buckley Highway (approx. RM 6.0, segment 16/11//10) No

written report documents these findings, but D. Nauer, WDFW, personal communication 7/27/1995 (cited in AES and Beck 1997) reported age-0 to age-4 cutthroat trout were collected by WDFW surveyors who electroshocked the stream up to this point.

Stream Flow/Hydrology Information

- Foster Wheeler (**1999**) report Fennel Creek is "very responsive to precipitation" (i.e., flashy). They predict that this "responsiveness" will continue to increase as urbanization and development continues in the watershed.

- Miscellaneous discharge readings at the USGS Fennel Creek gauge (located at RM 0.3 in segment 16/11//1) (**Williams and Riis 1989**):

Aug. 14, 1951	11.2 cfs
Aug. 31, 1967	6.2 cfs

- Foster Wheeler (**1999**) took flow measurements several days in late January when the stream was flooding:

Jan. 15, 1999	21 cfs (at RM 4.6, lower bound of segment 16/11//7)
Jan. 21, 1999	36 cfs (at RM 4.6, lower bound of segment 16/11//7)
Jan. 28, 1999	42 cfs (at RM 2.5, lower bound of segment 16/11//6)

- Foster Wheeler (**1999**) classified the reach immediately downstream of McCutcheon Road (RM 0.3, in segment 16/11//1) as low for hydrologic function due to significant aggradation of gravels near the road. Aggradation has reduced the storage capacity of the creek in this area, which negatively affects the ability of the creek to pass peak flows.

- The lower reach of segment 16/11//1 near the Puyallup River confluence was rated high for hydrologic function; functions well for peak flow conveyance.

- Stream in segment 16/11//3 spot-surveyed 300 ft. downstream of segment upper bound rated high for hydrologic function; channel functions well for peak flow conveyance (**Foster Wheeler 1999**). Stream gradient 2.7%, wide bank full width (30 ft. in places). Abundant channel roughness elements (LWD, boulders, streambank vegetation).

- Segment 16/11//6: sinuosity 1.25, somewhat meandering; provides somewhat greater capacity for peak flow reduction (**Foster Wheeler 1999**); overall hydraulic function rated moderate by Foster Wheeler (**1999**).

- The Willowbrook development being constructed west of the creek (upper segment 16/11//6 or lower segment 16/11//7) may increase peak flows in and downstream of segment 16/11//6 if the stream is not adequately buffered (**Foster Wheeler 1999**). The development will include two large retention ponds approximately 100 ft west of the creek for stormwater management. Soils west of the creek where this development is to

occur are more gravelly and better-draining than soils east of the creek (**Foster Wheeler 1999**).

- Segment 16/11//7 spot-surveyed at several points by Foster Wheeler (**1999**). From the segment lower bound upstream to SR-410 crossing (RM 3.8), sinuosity is 1.11; moderate amounts of channel roughness features; streambanks stable with little evidence of erosion. It appears that construction of drainage ditches and installation of drain tiles have converted what was once wetland habitat into upland pasture. These drainage features have negatively altered stream hydrology and hydrology in emergent wetland areas adjacent to the creek in this segment.

- From SR-410 upstream to crossing of Old Sumner-Buckley Highway (approximately RM 4.2 also in segment 16/11//7), drain tiles in the pasture area and dikes south of the Highway have significantly altered stream hydrology. The drain tiles remove water that would have saturated or inundated what is now pasture land, and dikes adjacent to a WSDOT wetland mitigation site (see below) reduce the active capacity of the floodplain. This channelization accentuates peak flows and creek bed scour in this localized area.

- Both WSDOT and Pierce County manage wetland mitigation sites in the pasture near the Old Sumner-Buckley Highway crossing in segment 16/11//7. The WSDOT site is south of the Highway; the Pierce County site is north of the Highway.

- Tributary 0407 and its tributary 0408, draining from Bonney Lake and Deborah Jane Lake respectively, form the upper bound of segment 16/11//7. These tributaries flow southeast then south through an area of high density residential land use to Church Lake Road, then through a culvert into the pasture to join Fennel Creek at Fennel Creek RM 4.6. This tributary system is a substantial source of water to Fennel Creek (**Foster Wheeler 1999**).

- Historical aerial photos (not seen; cited in Foster Wheeler 1999) reveal a drainage channel on the eastern edge of the pasture bordering the upper portion of segment 16/11//7. This probably carried stormwater runoff from the upland area south of Fennel Creek and east of the crossing of Old Sumner-Buckley Highway to a junction with Fennel Creek just upstream of SR-410 near RM 3.8. The segment of this old drainage channel lying south of the Old Sumner-Buckley Highway has been drained and filled. Some flowage from this old channel is now diverted into a ditch along the north side of Old Sumner-Buckley Highway which flows directly west into Fennel Creek at about RM 4.2.

- Foster Wheeler (**1999**) has recommended reconnecting this old drainage channel and routing it to its original junction with Fennel Creek at RM 3.8 as a means of improving hydraulic function of this reach.

- Hydraulic function of the upper reach of segment 16/11//7 upstream of Old Sumner-Buckley Highway was rated poor by Foster Wheeler (**1999**). Currently this reach of the

creek is unable to handle the quantity of stormwater runoff generated from surrounding areas.

- Segment 16/11//8 spot-surveyed by Foster Wheeler (**1999**). Sinuosity low (value of 1.06 calculated from USGS map); gradient 0.33% (also measured from map). Lack of channel roughness elements; little streamside vegetation. These features allow water flow to increase in velocity as high flows pass through this segment. This is usually a formula for scour and erosion, but stream banks appear stable (**Foster Wheeler 1999**).

- Foster Wheeler (**1999**) surveyed segment 16/11//9 from roughly RM 5.4 to Rm 6.0; reported that the creek has been substantially modified from historic conditions here. Ditches along 214th Ave. E. at the east end of the surveyed reach and 206th Ave. E. on the west end have modified the drainage network and contribute water to Fennel Creek. Old Sumner-Buckley Highway runs adjacent to the creek, preventing lateral migration. The majority of segment 16/11//9 is channelized and contained in what amounts to a drainage ditch alongside Old Sumner-Buckley Highway. During high rainfall events, stormwater enters the creek directly from the Highway and from the ditches at 214th Ave. E. and 206th Ave. E.

- These features have completely altered the hydrologic function of the creek in segment 16/11//9. High water velocities in the creek erodes sediment from the channel. Faster flows result in even more sediment discharged into the creek.

- Segment 16/11/1 is within the Puyallup River 100-year floodplain (**Montgomery 1991**).

Total Impervious Area (TIA)

- Segments 16/11/1 through 16/11/4 flow through land uses zoned “Rural Five,” estimated TIA 10 percent based on May et al. (**1997**).

- Segment 16/11//5 encompasses Victor Falls. This segment is in land designated as City of Bonney Lake ownership. It is a ravine segment which appears to be forested; TIA estimated to be zero.

- Lower half of segment 16/11//6 flows through land designated “Reserve Five,” estimated TIA 10 percent. Upper half is in land designated City of Bonney Lake ownership and may be approaching densities in the medium density residential range, estimated TIA 35 percent based on May et al. (**1997**).

- Segment 16/11//7 flows through lands designated ”Moderate Single Family,” estimated TIA 35 percent, except for the upper two-thirds which is in lands designated “Reserve Five,” estimated TIA 10 percent based on May et al. (**1997**).

- The upper bound of segment 16/11//7 marks the confluence of Tributary 0407, which drains heavily populated uplands in the City of Bonney Lake around Bonney Lake itself and Dorothy Jane Lake. This portion of the Fennel Creek basin is approaching high density residential, estimated TIA 60 percent based on May et al. (**1997**).

- Segment 16/11//8 is mostly agricultural land, estimated TIA 5 percent.

- Segment 16/11//9 flows through lands designated "Reserve Five" except for the upper third which is designated "Rural Ten," estimated TIA for the total segment 10 percent based on May et al. (**1997**).

- Segments 16/11//10 through 16/11//12 flow through lands designated "Rural Ten," estimated TIA 10 percent based on May et al. (**1997**).

- Segment 16/11//13 passes from land designated "Reserve Five" into land designated "Community Center" and then heads up in an "Agricultural" block. Estimated TIA 10 percent.

Channel and Flow Modifications

- The Willowbrook development being constructed west of the creek near upper segment 16/11//6 or lower segment 16/11//7 may increase peak flows in and downstream of segment 16/11//6 if the stream is not adequately buffered (**Foster Wheeler 1999**). The development will include two large retention ponds approximately 100 ft west of the creek for stormwater management. Soils west of the creek where this development is to occur are more gravelly and better-draining than soils east of the creek (**Foster Wheeler 1999**).

- Segment 16/11//7: construction of drainage ditches and installation of drain tiles have converted what was once wetland habitat into upland pasture within this segment (**Foster Wheeler 1999**). These drainage features have negatively altered stream hydrology and hydrology in emergent wetland areas adjacent to the creek in this segment.

- From SR-410 upstream to crossing of Old Sumner-Buckley Highway (approximately RM 4.2 also in segment 16/11//7), drain tiles in the pasture area and dikes south of the Highway have significantly altered stream hydrology. The drain tiles remove water that would have saturated or inundated what is now pasture land, and dikes adjacent to a WSDOT wetland mitigation site reduce the active capacity of the floodplain. This channelization accentuates peak flows and creek bed scour in this localized area.

- Historical aerial photos (not seen; cited in Foster Wheeler 1999) reveal a drainage channel on the eastern edge of the pasture bordering the upper portion of segment 16/11//7. This probably carried stormwater runoff from the upland area south of Fennel

Creek and east of the crossing of Old Sumner-Buckley Highway to a junction with Fennel Creek just upstream of SR-410 near RM 3.8. The segment of this old drainage channel lying south of the Old Sumner-Buckley Highway has been drained and filled. Some flowage from this old channel is now diverted into a ditch along the north side of Old Sumner-Buckley Highway which flows directly west into Fennel Creek at about RM 4.2.

- Foster Wheeler (**1999**) surveyed segment 16/11//9 from roughly RM 5.4 to Rm 6.0; reported that the creek has been substantially modified from historic conditions here. Ditches along 214th Ave. E. at the east end of the surveyed reach and 206th Ave. E. on the west end have modified the drainage network and contribute water to Fennel Creek. Old Sumner-Buckley Highway runs adjacent to the creek, preventing lateral migration. The majority of segment 16/11//9 is channelized and contained in what amounts to a drainage ditch alongside Old Sumner-Buckley Highway. During high rainfall events, stormwater enters the creek directly from the Highway and from the ditches at 214th Ave. E. and 206th Ave. E.

Culvert/Barrier Analysis

- Pierce Conservation District (**2000**) reports no blocking culverts or other man-caused barriers up to Victor Falls , RM 2 (segment 16/11//5). Survey was not continued above this point.

- Victor Falls (segment 16/11//5) is an impassable natural barrier (**Williams et al. 1975**) and marks the upstream distribution limit of anadromous and migratory fish. A steep cascade occurs at RM 1.5 downstream of Victor Falls in segment 16/11//3, but this was not considered a barrier to upstream migration of fish by Williams et al. (**1975**).

Riparian Condition/Riparian Breaks

Segment 16/11//1:

- Riparian vegetation black cottonwood, salmonberry & snowberry at Puyallup River confluence.

- Upstream to McCutcheon Road, riparian buffer has been altered by adjacent land uses. Little vegetation is present on north side of creek, and non-native Himalayan blackberry dominates where vegetation does exist. On south side of creek, black cottonwood & red alder dominate but non-native blackberry is plentiful (reported by Foster Wheeler 1999).

Segment 16/11//3:

- A forested ravine. Foster Wheeler (**1999**) spot-surveyed 300 ft downstream of segment upper bound at about RM 1.7; reported good riparian vegetation and function; red alder, salmonberry, sword fern, mix of conifer species including western red-cedar and western hemlock.

Segments 16/11//4 and 16/11//5:

- Forested ravine. Good riparian vegetation and function. Red alder, salmonberry, sword fern, mix of conifer species including western red-cedar and western hemlock (**Foster Wheeler 1999**).

Segment 16/11//6:

- Foster Wheeler (**1999**) spot-survey reach located within a riverine scrub-shrub vegetative community, but the stream flows through adjacent pasture land with little or no riparian buffer.
- Himalayan blackberry is the dominant riparian vegetation.
- Several areas noted where the streambank has been trampled and caved in by livestock, but the livestock has since been removed from the reach.

Segment 16/11//7:

- Segment 16/11//7 spot-surveyed at several locations by Foster Wheeler (**1999**). Valley was originally forested but was largely cleared when land use changed to agriculture (no range of dates for this conversion was given). Some trees remain along the left bank in lower part of the segment downstream of SR-410 crossing (red alder, red cedar, black cottonwood, with salmonberry, red elderberry, cascara and Pacific blackberry in the understory), but right bank has poorly developed riparian vegetation consisting mostly of shrubs and Himalaya blackberry.
- Riparian condition mostly pasture in upper portion of segment 16/11//7 as well, converted from former wetland and forested wetland by tree removal and draining by means of tiles and ditches.
- WSDOT and Pierce County manage wetland mitigation sites in the pasture south and north respectively of the Old Sumner-Buckley Highway crossing (approximately RM 4.2).
- Diking has channelized the reach adjacent to the WSDOT site south of the Highway crossing.

Segments 16/11//8:

- Segment spot-surveyed by Foster Wheeler (**1999**).
- Riparian condition mostly pasture in upper portion of segment 16/11//7 as well, converted from former wetland and forested wetland by tree removal and draining by means of tiles and ditches. Little streamside vegetation.

Segment 16/11//9:

- Foster Wheeler (**1999**) surveyed from roughly RM 5.4 to Rm 6.0.
- Relatively mature riparian forest along the north side of the creek; no vegetation along the south side, which is the Old Sumner Buckley Highway road bed and shoulder.
- Despite presence of the Highway, canopy closure is high and overhanging vegetation is high, consequently the creek is shaded during warm months which helps to moderate water temperatures.
- Total stream crossings (roads, driveways, fords, railroad tracks and the like) 12; i.e., 1.5 crossings per mile of stream.

Water Quality/Section 303(d) Listings

- None.

CANYONFALLS CREEK, STREAM 0410

General Description

- Confluence with Puyallup River at Puyallup RM 16.2, T 19 N, R 5 E, n half sec 7.
- Stream length listed as 3.0 miles and drainage area 1.71 sq. mi. in Williams et al. (**1975**); however, Huckell/Weinman (**1998**) give total tributary surface area as 3.8 sq. mi.
- Heads in wetlands in a geological depression on the border between se. 8 and 9 of T19N, R5E, approximately 0.5 mi. south of Victor Falls. However, there may not be an open channel here; only a series of wetlands downstream to RM 1.8, around a “fish hook bend” where the stream turns west (**AES and Beck 1997**). The first surface water “daylights” at about RM 1.8; flows just north of west to the Troutlodge Hatchery at about RM 1.0 where the hatchery water intake (water right for 15 cfs) dries the channel. Return water from the hatchery reenters the stream at RM 0.86. Stream drops through a steep ravine (gradient 17-18 percent) to McCutcheon Road, RM 0.55. The stream

flattens immediately below the road and turns north to join the Puyallup River at Puyallup RM 16.2.

- Headwaters are undeveloped and forested down to the Troutlodge Hatchery. Land use downstream of McCutcheon Road appears to be agricultural and sparse residential.

Stream Segments and Attributes

Segment attributes from SSHIAP based on WDNR/WDFW hydrolayer.

Segment	Length, ft.	Habitat Class	Gradient/Confinement
16/12//1	2800	1	< 1% unconfined
16/12//2	600	1	4-8% confined
16/12//3	1200	1	> 20% confined
16/12//4	600	1	< 1% unconfined
16/12//5 (revised)	4800	1	< 1% unconfined
16/12//6 (new)	6200	1	< 1% unconfined

Stream Habitat Survey

Segment 16/12//1:

- Survey by AES and Beak (**1997**) based on 1995 field work.
- Lowest 0.3 mi. runs and pools; water gradually slows and deepens due to backwater effect of Puyallup River. Substrate in lowest 0.3 mi. is 100% fine sediment.
- RM 0.3 to McCutcheon Road (RM 0.6): consists of riffles and runs with occasional pools in these proportions:

Habitat Unit	Length, ft	Mean wetted width, ft	Area, sq. ft.
Pool	57.1	16.4	935.5
Run	775.3	23.0	17,786
Riffle	838.6	15.7	13,192

- The few pools in this reach are formed by lateral scour and by small woody debris dams. Pools contain little cover. There are few pieces of LWD in the channel. Substrate is predominately gravel but there is progressively more fine sediment in the downstream direction.

- Rearing habitat judged limited due to lack of refuge cover, lack of LWD in channel, lack of undercut banks, lack of overhanging vegetation.

Segment 16/12//2:

- This reach comprises McCutcheon Road crossing upstream to RM 0.64.

- Moderate to high gradient riffles upstream for about 400 ft., where a series of cascades begins.

- Substrate predominately gravel.

- A cascade at the upper bound of the segment at RM 0.64 is a natural block to upstream movement of anadromous and migratory fish.

Segment 16/12//3:

- Stream gradient 17-18 percent.

- A series of steep cascades dominate here. Substrate predominately cobble and large boulders, with small patches of trout-size gravel adjacent to the boulders.

- Twice as much functional LWD in channel here as in segment 16/12//1.

- The upper bound of this segment at RM 0.86 is the return water from the Troutlodge Hatchery.

Segment 16/12//4:

- This segment extends from RM 0.86 to the water intake for the Troutlodge Hatchery at RM 1.0.

- The channel is dry in this segment. The stream is essentially diverted through the hatchery in this segment.

Segment 16/12//5:

- This segment is hereby re-described as extending from RM 1.0 at the Hatchery intake upstream to RM 1.8 where the stream "daylights" as a perennial stream.

- There is a series of wetlands in this segment through which the stream flows slowly over a bottom substrate of fine sediment and organic matter. Remainder of the channel is run and pool habitat with some riffles, in the following proportions:

Habitat Unit	Length, ft	Mean wetted width, ft	Area, sq. ft.
Pool	1,236	48.2	59,543
Run	1,706	54.1	92,241
Riffle	394	29.9	11,761

- Substrate in these pool-run-riffle reaches is trout-size gravel.

- Many pieces of LWD in channel; good refuge and overhead cover for resident salmonids.

Segment 16/12//6:

- This segment is newly defined and extends upstream from RM 1.8 to RM 3.0. The channel in this segment is dry and is defined only by a few linear wetlands. A formal stream type change will be submitted to DNR for this segment.

Fish Utilization Information

- Anadromous and migratory fish utilize the stream up to McCutcheon Road (upper bound of segment 16/12//1) owing to questionable culvert; possible access and use up to impassable cascades at RM 0.64.

- Principal spawning area for anadromous fish is 100 m (300 ft) reach in segment 16/12//1 immediately downstream of McCutcheon Road; other spawning occurs downstream to RM 0.3 where fine sediment deposition increases embeddedness to ~100 percent.

- Principal species use is chum salmon (one of largest chum salmon runs in the Puyallup system, may be second only to Fennel Creek). Small coho run. Small steelhead run. Pink salmon in odd years. No chinook have been observed (although only one formal

survey for chinook has been made, observers watch for them during odd-year pink salmon surveys; none have ever been observed).

- Summary of spawning data compiled by WDFW and Puyallup Tribe; cited in AES and Beck (**1997**):

	Spawning Season	Period of Record	Mean Peak Density Fish/mile
Chum	Dec-Jan	1970-1996	191.8
Coho	Oct-Jan	1970-1996	37.9
Winter steelhead	Dec-Jan	1982-1995	38.7
Pink (odd years only)	Sept-Oct	1981, 1989, 1995	1.7
Chinook	Sept-Oct	1976 (only formal survey)	0

- Other fish species reported (**AES and Beck 1997**):

  In segment 16/12//1: cutthroat (estimated density 0.34 fish/sq. m.), rainbow (or juvenile steelhead), juvenile coho (estimated density 0.11 fish/sq. m), sculpin spp., and larval Pacific lamprey.

  In segment 16/12//5 upstream from Troutlodge Hatchery intake: cutthroat (juveniles 50 mm and less and adults > 50 mm) and sculpins collected at RM 1.46; cutthroat juvs and adults collected at RM 1.7.

- In segment 16/12//6 the stream is dry except for a line of isolated wetlands, and appears to be non-fish bearing water. A formal stream type change will be submitted to DNR for this segment.

Culvert/Barrier Analysis

- Pierce Conservation District (**2000**) lists culvert at McCutcheon Road (upper bound of segment 16/12//1) as questionable for passage; appeared blocked when viewed on 2/8/2001.

- Impassable cascades at RM0.64, segment 16/12//3 (**Williams et al. 1975; AES and Beck 1997**).

- Troutlodge Hatchery intake dewaters channel in segment 16/12//4.

Stream Flow/Hydrology and Water Temperature Information

- Streamflow monitored from Nov., 1995 to Dec., 1996 (reported in Huckell/Weinman 1998):

high	21.0 cfs primarily in summer
low	8.7 cfs primarily in winter
Av. annual	16.0 cfs

- One-time only streamflow and temperature measurements made at RM 0.4, Sept. 23, 1996 (reported by AES and Beck 1997): discharge 12.6 cfs; water temperature 12^{O} C.

- Another one-time streamflow measurement made by USGS 800 ft. upstream from pipeline road crossing (in segment 16/12//5) on Sept. 2, 1965 (reported in Williams and Riis 1989): discharge 13.8 cfs.

- Discharge does not vary significantly during storm events (**Huckell/Weinman 1998**).

- Periods of high and low flow in Canyonfalls Creek occur at different times of year than in the Puyallup River.

- Huckell/Weinman (**1998**) state that a large proportion of Canyonfalls Creek water supply is groundwater input from an aquifer beneath the Cascadia development site. About 75 percent of this site (total acreage 4719 acres) provides groundwater capture for Canyonfalls Creek.

- Canyonfalls Creek discharge appears to be somewhat higher than the nearby, larger Fennel Creek drainage. This may be due to the substantial groundwater input reported by Huckell/Weinman (**1998**).

- Segments 16/12//1 and at least a portion of 16/12//2 lie within the Puyallup River 100-year floodplain (**Montgomery 1991**).

Total Impervious Area (TIA)

- Segments 16/12//1 through 16/12//5 flow through land zoned “Rural Five;” estimated TIA 10 percent.

- Segment 16/12//6, although zoned “Employment Based Planned Community” to reflect its location within the Cascadia development, is located in a forested canyon intended to be preserved from development; estimated TIA zero. TIA of the Cascadia development itself, presently in early success ional forest land (TIA essentially zero), is expected to increase to greater than 20 percent over the next 20 years (**Huckell/Weinman 1998**).

Channel and Flow Modifications

Riparian Condition/Riparian Breaks

- Downstream of McCutcheon Road (segment 16/12//1), riparian zone dominated by red alder but also contains mature bigleaf maple and mature black cottonwood.
- Red alder, Douglas-fir, western hemlock and red-cedar occur along the riparian zone in headwaters down to Troutlodge hatchery (segments 16/12//5 and 16/12//6).
- Total stream crossings (roads, driveways, fords, railroad tracks and the like) 3; i.e., 1.0 crossings per mile of stream.

Water Quality/Section 303(d) Listings

- None.

HORSE HAVEN CREEK, STREAM 0589 (AND TRIBUTARIES 0590, 0591, 0592 & 0593)

General Description

- Confluence with Puyallup River at Puyallup RM 20.2; T 19 N, R 4 E, n half sec 25.
- Horse Haven mainstem stream length given as 3.3 miles, drainage area not stated; Tributary 0590 stream length given as 1.4 miles (**Williams et al. 1975**). Tribs 0591, 0592, and 0593 are mapped in Williams et al. (**1975**) but no stream lengths are given.
- Mainstem heads at a small 1 to 1.4 acre lake, el. ~440 ft, in T18N, R5E, sec. 6, southwest of the Orting Soldiers Home. It drains west then north through a steep gully with an impassable cascade, and emerges on the valley floor near the Soldiers Home where it is joined by tribs 0592 and 0593. The stream becomes a valley tributary flowing northwest along the base of the bluff for approximately 2 miles to its confluence with Tributary 0590 (called Lorraine Creek by Pierce Conservation District 2000) which itself originates at a pond, el ~450 ft., in T19N, R4E, SW 1/4 of SW 1/4 sec. 36, then flows west down a steep ravine with an impassable cascade to the valley floor where it turns north to join the mainstem. Horse Haven then continues north-northwest to join the Puyallup River at Puyallup RM 20.2.
- The gullies of both the mainstem and Tributary 0590 appear inaccessible and forested (based on the USGS Orting quad revised 1994). However, the headwaters of Tributary

0590 (Lorraine Creek) are located in an area designated Master Planned Community on the Pierce County land use map and are within the boundary of the Rainier Terrace Planned Community development (**Thorpe and Stepan 1985**). The valley floor is a mixed use area; homes and agriculture.

- NOTE: the Puyallup Tribe considered building a hatchery somewhere in the upper valley floor reaches of the Horse Haven Creek system but abandoned the idea due to ephemeral nature of the streamflow in the late summer months (**R. Ladley, Puyallup Tribe, personal communication 3/19/2001**).

Stream Segments and Attributes

Segment attributes from SSHIAP based on WDNR/WDFW hydrolayer.

Segment	Length, ft.	Habitat Class	Gradient/Confinement
16/20//1	5600	1	< 1% unconfined
16/20//2	3200	1	< 1% unconfined
16/20//3	400	6 (lake, 1.4 acres)	< 1% unconfined
16/20//4	5200	1	< 1% unconfined
16/20//5	600	1	1-2% unconfined
16/20//6	1600	1	1-2% confined
16/20//7	400	1	4-8% confined
16/20//8	600	1	8-20% confined
16/20//9	400	1	> 20% confined
16/20//10	600	1	8-20% confined
16/20//11	600	6 (lake, 2.9 acres)	< 1% unconfined
16/20//12	600	1	4-8% confined
Tributary 0590			
16/20/2//1	4000	1	< 1% unconfined
16/20/2//2	1600	1	> 20% confined
16/20/2//3	800	1	4-8% confined
16/20/2//4	1000	1	2-4% unconfined
16/20/2//5	200	6 (lake, 1.4 acres)	< 1% unconfined
16/20/2//6	600	8 (wetland, 4.3 acres)	< 1% unconfined

Stream Habitat Survey

Fish Utilization Information

- Williams et al. (**1975**) listed both Horse Haven and Tributary 0590 as used by coho and possibly used by chum.
- Chum use of Horse Haven confirmed by D. Nauer, WDFW (**personal communication 3/19/2001**).
- Puyallup River EDT Project (ongoing 2001) lists coho use upstream to RM 3.2 in mainstem (to impassable cascade) and upstream in Tributary 0590 to RM 0.9 (to impassable cascade).
- WDFW/WDNR Hydrolayer types the mainstem as fish bearing water to impassable cascade at RM 3.1; Tributary 0590 typed as fish bearing water to mouth of gully at valley wall, RM 0.8.
- Puyallup River EDT Project (ongoing 2001) presumes bull trout present in the fish bearing reaches.
- R. Ladley (**Puyallup Tribe, personal communication 3/19/2001**) says tribal biologists have electroshocked cutthroat trout and juvenile coho in upper valley floor segments of the Horse Haven system, but he is unsure if adult coho access these reaches for spawning. He considers it more likely that juvenile coho spawned elsewhere are finding and using these stream reaches as rearing habitat.
- Based on Pierce Conservation District (**2000**) barrier analysis, present upstream extent of anadromous and migratory fish use may be RM 1.4 on mainstem, owing to an impassable culvert under Goltz Rd. at this location. Aside from a questionable culvert at RM 0.2, upper extent of anadromous and migratory fish use of Trib. 0590 appears to be RM 0.8.
- According to Wolcott (**1965**), the lake at the head of Tributary 0590 (called Thun Field Pond or Howe Road Pond) is a 10-acre pond (variable in size) formed by beaver dams. Rainbow trout were stocked prior to 1965 as were “Montana black-spotted trout” (hatchery reared Yellowstone or westslope cutthroat trout, stocked in 1958) for recreational angling (**Wolcott 1965**), but WDFW has no record of these or any more recent fish plants in its file (**T. Cropp, WDFW, personal communication 2001**).

Stream Flow/Hydrology

- Segment 16/20//1 lies within the Puyallup River 100-year floodplain (**Montgomery 1991**).

Culvert/Barrier Analysis

- Pierce Conservation District (**2000**) lists culvert at RM 0.4, crossing of 168th St. NE (Goltz Rd), questionable for passage; looked passable when viewed on 2/8/2001.
- Another questionable culvert mapped at a spur driveway west of Goltz Rd at about RM 1.2.
- Impassable culvert mapped at RM 1.4, crossing of Goltz Rd.
- Impassable driveway culvert mapped just south of Orting-Kapowsin Road in segment 16/20//5.
- Impassable cascade on mainstem at RM 3.1 (segment 16/20//9).
- On Tributary 0590, questionable culvert mapped at RM 0.2, segment 16/20/2//1.
- Impassable cascade on Tributary 0590 at RM 0.8 (midway in segment 16/20/2//2).

Total Impervious Area (TIA)

- Segments 16/20//1 through 16/20//3 and the lower three-quarters of segment 16/20//4 flow through lands zoned “Rural Five,” estimated TIA 10 percent (**May et al. 1997**).
- Upper quarter of segment 16/20//4 and all of 16/20//5 flow through lands designated “Agricultural,” estimated TIA 5 percent (**May et al. 1997**).
- Segment 16/20//6 grades through lands designated “Agricultural” to “Rural Ten,” estimated TIA ranges from 5 percent to 10 percent (**May et al. 1997**).
- Segments 16/20//7 through 16/20//12 flow through lands designated “Rural Ten,” estimated TIA 10 percent (**May et al. 1997**).

Riparian Condition/Riparian Breaks

- Large duck pond with wier and private beautification project constructed where stream flows through private property just upstream of Goltz Road crossing (RM 1.4) (**PCT and E. Adams, Entranco, field reconnaissance 2/8/2001**).

- Total stream crossings (roads, driveways, fords, railroad tracks, and the like; mainstem only) 9; i.e., 2.7 crossings per mile of stream.

Channel and Flow Modifications

Water Quality/Section 303(d) Listings

- None listed.

APPENDIX G

MID-PUYALLUP BASIN FISHERIES AND HABITAT CHARACTERIZATION

PART 2 – FIELD ASSESSMENT REPORT

Pierce County
Public Works and Utilities
Water Programs Division

Mid-Puyallup Basin Fisheries and Habitat Characterization

Part 2 –Field Assessment Report

June 2002

ENTRANCO

Part 2 –Field Assessment Report

MID-PUYALLUP BASIN FISHERIES AND HABITAT CHARACTERIZATION

Pierce County, Washington

Prepared for

Pierce County Public Works and Utilities
Water Programs Division

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(Revised March 8, 2002)

INTRODUCTION

The Mid-Puyallup Basin extends upstream along the Puyallup River from approximately river mile (RM) 7 below Puyallup to approximately RM 26.5 upstream of Orting, not including the Carbon River and Stuck River drainages. Pierce County Public Works and Utilities, Water Programs Division, has begun a planning process to identify and prioritize its projects and other activities within this basin, in order to update the storm drainage and surface water management plan adopted by the County in 1991. Information regarding water management issues such as flooding, water quality and quantity, and fisheries resources is being collected and will be evaluated to determine the most effective means of protecting resources and preventing damage to public and private properties.

Specifically, we were asked to address fisheries and fish habitat condition in six tributaries of the Mid-Puyallup Basin, including:

- Unnamed tributary 0399, confluence at Puyallup RM 12.2;
- Unnamed tributary 0400, confluence at Puyallup RM 13.1;
- Ball Creek, tributary 0405, confuence at Puyallup RM 14.9;
- Fennel Creek, tributary 0406, confluence at Puyallup RM 15.5;
- Canyonfalls Creek, tributary 0410, confluence at Puyallup RM 16.2;
- Horse Haven Creek, tributary 0589, confluence at Puyallup RM 20.2.

The Scope of Work for this project mandated that we evaluate baseline habitat conditions in these six tributaries using the protocol set forth in the Tri-County Urban Issues ESA Study (R2 Consultants et al. 2000). This protocol uses a two-phased approach. Phase I is essentially a desktop exercise using information from existing sources to pre-classify habitat into reaches suitable for use by fish, reaches unlikely to be suitable for use, and reaches requireing a “second look,” i.e., a closer examination in the field, which is done in Phase II. The output of this assessment is a classification of segments of each tributary as Good, Fair, or Poor habitat for fish.

Results of the Phase I pre-field work were presented In our earlier report (Trotter 2001). Based on these results, we recommended field surveys of stream segments in Ball Creek, Fennel Creek, Canyonfalls Creek, and Horse Haven Creek.

METHODS

Application of Tri-County Phase II Methodologies

The Tri-County Phase II assessment module uses a standard suite of field methods to measure habitat quality and quantity in terms of ten parameters: (1) riparian condition, (2) substrate composition, (3) embeddedness of dominant substrate, (4) bank condition, (5) condition of benthic invertebrate community (BIBI score), (6) passage barriers, (7) pool frequency, (8) channel pattern/bedform, (9) large woody debris (LWD), and (10) water temperature (7-day average maxima).

Items 1 through 4 and 6 through 9 were measured during the month of June, 2001 in segments where we were able to aquire permission for access. Item 5, the assessment of benthic invertebrate community condition using the so-called Benthic Index of Biotic Integrity, or BIBI score, requires collections to be made in the field during the month of September (May et al. 1997). For item 10, we could not collect the data for 7-day average maxima determinations. Rather, we report the water temperature as we found it on the day of the survey. We ascertained fish presence/absence in the segments surveyed using visual observation, seining, or backpack electroshocking as conditions required.

Further on the BIBI methodology, scores for BIBI ratings range from 10 to 50; the poorer or more degraded the site the lower the BIBI score. Sites scoring 35 and above are generally considered good to excellent sites, those scoring below 25 are considered poor. In the field, it is desired that samples be collected from gravel riffles. When we could not find any suitable collection habitat anywhere at the site, we automatically gave that site the lowest possible score and enclosed that score in parentheses, ie., (10). This happened for two of the stream segments we evaluated. At another stream segment, we were refused access for BIBI collection where we had been granted permission earlier in the year when we conducted the physical habitat survey. No BIBI score was entered for this segment.

In addition to these parameters, Pierce County requested that we also measure dissolved oxygen concentration, pH, conductivity, and turbidity at each surveyed segment, which we did using standard instrumental methods and instruments supplied by the County. All measurements reported here were made on the same day when all streams were flowing at seasonally normal levels, except for a series of

measurements made on Fennel Creek where we tracked changes in water quality at a single site over a period of 3 weeks following a bankfull rain event.

RESULTS

This section presents results of the field assessment of fisheries, fish habitat, water quality, and BIBI scores in accessible segments of Ball Creek, Fennel Creek, and Horse Haven Creek. Additional information was also obtained about the fisheries, habitat, and water quality values of upper segments of Canyonfalls Creek which precluded the necessity of field work in this system.

Completed field data forms for the survey are included in Appendix A, with narrative descriptions of habitat condition presented below. Appendix B contains a set of 35-mm slides of typical habitat features taken at various points in the survey. Appendix C summarizes BIBI scores for surveyed stream segments.

Ball Creek, Stream 0405

OVERALL DESCRIPTION

Ball Creek is a valley floor tributary originating south of Old Military Road at the base of a bluff that forms the Puyallup Valley west wall. This stream flows diagonally northeast across the valley floor, crosses SR-162 and 106th St. E., and continues to its confluence with the Puyallup River at Puyallup RM 14.9 in Township 19 N, Range 5 E, section 6. Ball Creek flows through land alternately used for agriculture and residential housing.

Stream length is given in Williams et al. (1975) as 1.35 miles, and summation of SSHIAP segment lengths gives 1.7 miles. But we observed that even the SSHIAP stream length is in error. The source of Ball Creek appears to be a system of springs

and seeps coming down off the west valley wall at a point approximately 0.75 mile south of the mapped channel origin, about where the City of Tacoma aqueduct crosses the valley floor, giving an actual stream length closer to 2.4 or 2.5 miles. The channel appears to be perennial and large enough to be fish-bearing from that point northward.

Our field survey of Ball Creek stream segments was limited by the fact that we were denied access to segment 16/10//1 and much of segments 16/10//2 and 16/10//3. Our survey was thus restricted to only 220 ft of segment 16/10//2 from its lower bound at 106th St. E. upstream to the end of a cooperative local resident's ownership, and a 394 ft reach of segment 16/10//3 near its upper bound at Old Military Road, where we found another cooperative property owner.

PHYSICAL HABITAT SURVEY, SEGMENT 16/10//1

Although we were denied access to segment 16/10//1, the surrounding land and riparian corridor through which this segment passes to its confluence with the Puyallup River can be seen from 106th St. E. This is a large tract of agricultural land with a thin, discontinuous riparian corridor of shrubs and deciduous trees. At the upper bound of the segment at 106th St. E. is a large manmade duck pond surrounded by carefully landscaped grounds with willow trees whose folage overhangs and shades the pond.

The culvert under 106th St. E. and another culvert downstream of the duck pond are listed by Pierce Conservation District (2000) as blocking fish migration. Since salmon have been observed upstream of these culverts, we conclude that in their present condition they impede but do not block upstream or downstream movements of fish.

PHYSICAL HABITAT SURVEY, SEGMENT 16/10//2

A 220-ft reach of this segment was surveyed beginning at the upstream side of the culvert under 106th St. E. Riparian vegetation along the surveyed reach consists of manicured lawn on the RB and field grass on the LB. The RB property owner has planted several deciduous and coniferous trees near the creek, but they provide only limited shading. No trees are present along the LB. Upstream of the surveyed reach are homes and fields with riparian condition similar to the surveyed reach. At least one other manmade duck pond is visible upstream.

Immediately upstream of the 106th St. E. culvert, sediment has deposited in the stream bed to a depth of 2 ft. This restricts flow through the culvert to about one third of the potential flow volume. The property owner indicated that dredging of the channel has been a yearly neighborhood event in the past at this location, and flooding is a serious problem at 106th St. E.

Glide habitat predominates through the surveyed reach. There is no LWD in the channel. The only pools vsisble are the manmade duck ponds located upstream and downstream from the surveyed reach. Substrate consists of sand and silt up to the 2+20 mark, where small gravels appear. Our impression is that these gravels would comprise most of the streambed substrate were it not for the thick layer of fine sediment which has buried or heavily embedded these gravels over the years. Embeddedness of the gravel is about 25 percent at the upper end of the surveyed reach, but 100 percent over the remaining 90 + percent of the reach.

Pierce Conservation District (2000) has mapped two additional culverts in segment 16/10//2 as blocking. We were unable to examine these culverts. However, since salmon have been observed upstream of their locations, we conclude that in their present condition they impede but do not completely block upstream or downstream movements of fish.

PHYSICAL HABITAT SURVEY, SEGMENT 16/10//3

We surveyed 394 ft of this segment across the property at 14305 Military Road, moving upstream from the upstream side of a 2-ft diameter culvert listed as passable by Pierce Conservation District (2000). Here, 0.8 ft of deposited fine sediment reduces flow in the culvert by approximately 40 percent. Thick willow and vine maple dominate the riparian zone. There is little if any woody debris in the channel, which consists mostly of glide habitat with sand and fine sediment as the substrate.

The sediment layer in the channel and riparian condition remain as described until 0+65 where the willow and vine maple give way to a groomed lawn. At this point the sand and silt also give way to a well graveled streambed with small pools and gravel riffles, and generally quite good spawning habitat. Several of the small pools have residual depths equal to or exceeding 1 ft. Streambanks across the lawn area have been armored with rock by the property owners.

The habitat conditions described for the lawn area appear to continue upstream beyond our survey reach to the culvert where Military Road crosses, which marks the upper bound of segment 16/10//3.

WATER QUALITY MEASUREMENTS

Water quality measurements for Ball Creek stream segments 16/10//2 (measured upstream of 106th St. E.) and 16/10//3 (measured at 14305 Military Road) are shown in Table 1.

TABLE 1. WATER QUALITY, BALL CREEK STREAM SEGMENTS

Stream Segment	**16/10//2**	**16/10//3**
Dissolved Oxygen, mg/L	8.8	9.6
Turbidity, ntu	1.3	1.0
Conductivity, microsiemens	226	194
pH	7.8	7.9
Water temperature, degrees C	18.2	not recorded

BIBI SCORES

No suitable collection habitat could be found in the accessible length of segment 16/10//2. Therefore, a score of (10) was entered for this segment. No score was entered for segment 16/10//3 owing to denial of access to make the collection.

FISHES OBSERVED

During our survey, a school of approximately 20 coho salmon parr was observed on the downstream side of the106th St. E. culvert, just inside the upper bound of segment 16/10//1. Adult coho in the act of spawning in the creek were observed by a property owner near the upper end of segment 16/10//3 in November 2000, and the local WDFW biologist disclosed that adult coho ascended the creek at least as far as the culvert under Military Road, a few hundred feet upstream of our segment 16/10//3 survey location (D. Nauer, Washington Department of Fish and Wildlife, personal communication June 29, 2001). We also observed stream resident cutthroat trout during our survey of segment 16/10//3.

No releases of hatchery-origin coho have been made in this creek by the State or Tribes (C. Baranski, Washington Department of Fish and Wildlife, personal communication June 29, 2001). However, a local resident told us that in 1974 or 1975 a single "unofficial" release of between 500 and 1,000 coho fry was made by a property owner (who happened to be a hatchery worker) at the lower bound of segment 16/10//2 (B. Gregory, personal communication July 5, 2001).

PHASE II DECISION BOX

Although Ball Creek was observed to be a fish bearing stream and is utilized by coho salmon and cutthroat trout for spawning and rearing, we conclude from our pre-field and field observations that stream habitat quality and quantity is poor in most segments and can be ranked no better than fair in the other segment examined. Water temperature at the lower bound of segment 16/10//2 was 18.2^{O} C on the day of measurement, which exceeds the State DOE standard of no greater than 16^{O} C for tributaries of streams that are Shorelines of the State (the Puyallup River is such a stream), reinforcing our assessment of habitat quality of Ball Creek as poor to fair. Our Phase II Decision Box for stream segments in Ball Creek is shown in Table 2.

Table 2. Phase II Decision Box for Ball Creek Stream Segments

Channel Alteration	Habitat Quality and Quantity: Good	Fair	Poor
Low			
Moderate		16/10//3	16/10//1 16/10//2
High			

Fennel Creek, Stream 0406

OVERALL DESCRIPTION

Fennel Creek originates on the old Osceola mud flow near the north side of SR-410 east of the intersection with 234th St. E. The stream flows generally west toward the City of Bonney Lake, then turns south and flows through an old Vashon-age meltwater drainage channel that also was filled by a lobe of the Osceola mud flow (Crandell 1963) to Victor Falls, RM 2, where the course alters to the west through a steep canyon to the Puyallup Valley floor at McCutcheon Road, RM 0.4. There the stream flattens and turns north to flow across the valley floor to its confluence with the Puyallup River at Puyallup RM 15.5 in Township 19 N, Range 5 E, se corner of se corner of section 6. The stream has also been known in the past as Kelly Creek. Stream length is given as 7.95 miles and drainage area as 6.58 sq. mi. in Williams et al. (1975).

Fennel Creek drains a mixed use area of agriculture, rural, suburban and urban housing, plus some light industry. Much new housing development is occurring in the valley area and some within the canyon south of the City of Bonney Lake. A large gravel quarry (Maranatha Gravel) is located at the face of the bluff that forms the south valley wall of Fennel Creek just upstream from McCutcheon Road, approximately RM 0.5.

Near the Fennel Creek headwaters along Old Sumner-Buckley Highway, RM approximately 5.4–6.2, the stream parallels the roadway quite closely and flooding problems from stormwater flow occur. See Foster Wheeler (1999) for details of proposed solutions. Foster Wheeler (1999) has produced an environmental analysis of the entire Fennel Creek corridor for the City of Bonney Lake.

Based on the pre-field assessment (Trotter 2001), we wished to survey segments 16/11//6, 16/11//7 and 16/11//8 more closely in the field. We were unable to obtain access to segment 16/11//6; however, we were able to survey almost the entire length of segments 16/11//7 and 16/11//8.

PHYSICAL HABITAT SURVEY, SEGMENT 16/11//7

We accessed this segment at the downstream property boundary of Willowbrook Estates, which corresponds closely with the location of the segment lower bound. This point is just upstream of an island created by a channel split, which may delineate the actual SSHIAP segment boundary.

Riparian vegetation through this reach consists of a mixture of cedar, alder, maple and an occasional spruce, most trees 50-70 ft tall. Riparian condition is generally good; however, the right bank (RB) riparian zone is only one row of trees wide the entire length of the Willowbrook development which extends upstream 2942 ft from our starting point. A dike set back about 100 ft from the creek separates the development from the stream channel. Inside the dike are two retention ponds that we estimate are, combined, about an acre in size. An outlet from these ponds discharges into the creek at 269 ft. Springs seep into the channel from the RB at this point as well. At 630 ft, a fairly large, crystal-clear spring bubbles up in a left-bank (LB) pool. Water temperature in the seep was 2 deg. C colder than the water flowing in the main channel. A 500 ft break in the forested riparian zone occurs at 1481 ft,

where an open area, shaded only by thick, overhanging blackberry, salmonberry, and field grasses, occurs.

Streambanks appear stable through this reach, except at 630 ft, where the bank appears to be actively undercutting. The stream is shallow and dominated by riffle and shallow pool habitat. Substrate throughout this reach is cobble and gravel. At 1927 ft, a manmade rock weir creates a series of deeper pools upstream. Also at 1927 ft, the stream appears to have been straightened at some time in the past, as suggested by the presence of bank armoring and a RB dike.

Continuing upstream from the Willowbrook Estates boundary at the 2942 ft benchmark, the riparian corridor is dominated by older trees (alder, spruce, and cedar which we estimate to be 80-100 years in age). Channel condition and substrate continue as described, but considerable amounts of LWD are present in the channel where the stream flows through this older stand.

Not having permission to access the property parcel upstream, our survey of this portion of segment 16/11//7 concluded at a substantial natural logjam at 3743 ft, just upstream of where a LB side channel enters the creek. The survey resumed at the upstream side of the box culvert under SR-410.

Riparian Condition for the next 780 ft upstream from SR-410, consists of large 50-year-old cedar, maple, alder and ash. At 1209 ft a fence crosses the stream and has trapped a considerable amount of small woody debris, creating a jam that extends 20 ft upstream.

Riparian Condition changes dramatically at 1275 upstream from SR-410 where the 50-year-old timber gives way to low growing, relatively young planted willow, nine-bark, ash, cottonwood, and grass. This, we are told, is a mitigation area for riparian area lost to construction of the SR-410 overpass. The mitigation area extends upstream for approximately 1100 ft to the Sumner/Buckley Highway. Another fenced mitigation area starts 30 ft upstream from the culvert under Sumner/Buckley Highway and extends upstream for nearly 300 ft. This mitigation area has been planted with mostly deciduous plants within the last ten years and does not provide shade or recruitment potential at this time. Grasses border this portion of segment 16/11//7.

Bankfull width (BFW) measurements made along this reach of segment 16/11//7 fluctuate between 15 and 35 feet. Channel conditions consist of meandering undercut banks, a primary floodplain channel, secondary palustrine braided side channels, and a series of long glides. Throughout the bankfull channel there are aquatic plants, mainly bullrushes, but only a handful of trees occur along the stream, including alder, willow and crabapple, to the end of segment 16/11//7 where Bonney Lake Creek enters Fennel Creek 1938 ft upstream from Sumner/Buckley Highway. Bonney Lake Creek, with a 20 feet bankful width and adjacent wooded wetlands, introduces a significant volume of water to Fennel Creek. This water is considerably warmer than what is encountered in the mainstem (see water temperature measurements recorded in Table 4) and influences Fennel Creek water temperature for a considerable distance downstream.

PHYSICAL HABITAT SURVEY, SEGMENT 16/11//8

Upon entering segment 16/11//8, riparian condition quickly changes from an open, poorly shaded field to a well-shaded extremely dense willow thicket. Most of the trees and brush are less than twenty years old and do not offer LWD recruitment at this time. However some of the small woody debris as well as living trees were acting as pool forming control elements. A fence starts on the upstream side of the Bonney Lake Creek confluence and runs parallel to the stream along the left bank riparian corridor 8 to 15 feet back from the streambed. A cattle access gate (no signs of recent use) is located approximately 830 ft upstream from the segment lower bound.

Channel conditions remain the same as previously described, with meandering undercut banks, a primary floodplain channel, secondary palustrine braided side channels, and a series of long glides.

At 1530 ft, an unmapped tributary enters segment 16/11//8 from a pasture on the left bank. This stream is a ditched channel 4 to 6 ft wide and is draining a pastureland south of Fennel Creek. At this point the right bank riparian zone is a thickly covered mixture of willow, nine bark, blackberry, spirea and salmonberry while the left bank riparian zone is primarily field grass. Some of the RB alder and willow are in the 50-year age range and provide potential LWD recruitment. At 2740 ft a wetland drainage seep enters from the right bank. This stream is 2 to 4 ft wide and is associated with RB forested wetlands.

At 3815 ft, approximately three-fourths of the way through segment 16/11//8, LWD recruitment potential improves due to an ever-increasing number of medium to large alders primarily located along the right bank. There is also an abundance of small woody debris in the channel. At 4006 ft a 6-inch drainpipe enters from the LB possibly the outlet of drain tile draining pasture wetlands to the south.

Increasing amounts of garbage appear in the stream as the Kelly Road bridge is approached. A mixture of SWD and tires actually forms a pool control point at 4266 ft. However, the increasingly eclectic combination of litter includes disturbing items such as pesticide/herbicide application sprayers. At 4586 ft a chainlink fence serves as a garbage collection point.

It was determined to end the Fennel Creek field assessment at the Kelly Road bridge abutment at 4754 ft. While this bridge is approximately 200 feet downstream from the mapped upper bound of segment 16/11//8, spot-checking from Kelly Road led to the opinion that habitat features remain the same over this short distance as already described.

FISHES OBSERVED

We know from previous information (see Trotter 2001) that anadromous and migratory fish use Fennel Creek up to Victor Falls at RM 2.0, segment 16/11//5. This includes coho salmon, winter steelhead, pink salmon (in odd years), and one of the strongest runs of chum salmon in the Puyallup Basin.

Chinook salmon, listed as threatened under the U. S. Endangered Species Act, also use segment 16/11//1 and part of segment 16/11//2, although Fennel Creek is not considered a major spawning tributary for chinook (WDFW and WWTIT 1994).

Resident cutthroat trout have been reported from stream segments upstream of Victor Falls in the past, but we observed none during our present field work. One possible reason for our failure to detect trout in the stream is given below in the Water Quality section. We did observe sculpins (qualitatively the most abundant of the fishes), three-spine stickleback, and western brook lamprey in the segments surveyed.

WATER QUALITY MEASUREMENTS

Water quality measurements were taken at the lower bound of segment 16/11/7, at the Sumner Buckley Highway in segment 16/11//7, in Bonney Lake Creek a short distance upstream from the segment break between 16/11//7 and 16/11//8, and at the upper bound of segment 16/11//8. These measurements are recorded in Table 3 below.

TABLE 3. WATER QUALITY, FENNEL CREEK STREAMSEGMENTS

Stream Segment	16/11//7 Lower bound	16/11//7 Sumner/ Buckley	Bonney Lake Creek	16/11//8 Upper bound
Dissolved Oxygen, mg/L	8.2	11.7	7.5	8.1
Turbidity, ntu	1.5	1.5	1.4	2.0
Conductivity, microsiemens	185	159	186	162
pH	6.9	7.6	6.8	6.9
Water temperature, degrees C	11.2	13.4	14.1	13.2

On one of our attempts to survey the reach of segment 16/11//7 immediately upstream of the Sumner/Buckley Highway, we happened to arrive at the beginning of a heavy rain event that resulted in approximately 0.98 inches of precipitation over a 24-hour period. The creek was judged to be flowing at bankfull stage the day following this event. We took advantage to record a series of water quality measurements at this location at bankfull stage and over the ensuing 3-week period in order to assess any changes that might follow such an event. These measurements are presented in Table 4. Owing to a malfunctioning meter, conductivity readings were missed for all but the final day.

TABLE 4. WATER QUALITY OF FENNEL CREEK AT SUMNER/BUCKLEY HIGHWAY DURING RECOVERY FROM A BANKFULL RAIN EVENT

	6/12/01	6/14/01	6/21/01	7/03/01
Dissolved Oxygen, mg/L	9.2	9.3	9.7	11.7
Turbidity, ntu	7.6	7.6	1.9	1.5
Conductivity, microsiemens				159
pH	7.4	7.4	7.4	7.6
Water temperature, degrees C	11.0	11.0	12.4	13.4

The only notable changes in water quality revealed by the data in Table 4 are 1) the increase that occurred in dissolved oxygen content (the reading for 7/03/01 is actually greater than saturation for the water temperature measured that day, and may be a spurious reading) and 2) the dramatic decrease in turbidity, which is to be expected. All other conditions appear to have remained about the same as the stream receded to normal flows.

One final note on water quality: During our survey of segment 16/11//7 upstream from the SR-410 crossing, we spoke briefly with the property owner at 9217 Angeline Road. He stated that while there had once been cutthroat trout in the stream, approximately 8 to 10 years ago many trout had washed up dead along his property, leaving "eels" (probably western brook lamprey) and crayfish as the only aquatic species remaining in that portion of the creek. This was a one-time-only event indicative of a fish kill, possibly resulting from an agricultural chemical release since that was the major land use of the area at that time. This kill was evidently not reported to or investigated by responsible authorities, since no record of it could be found in WDFW or Department of Ecology files.

BIBI SCORES

Because of its length, three BIBI measurements were made for Fennel Creek stream segment 16/11//7. Two of these measurements were made near the lower bound of the segment, one upstream and one downstream of the large, crystal-clear spring, mentioned above, that bubbles up in a left-bank pool at 630 ft. The third measurement was made in the mitigation reach upstream of the Sumner/Buckley Highway crossing. At the client's request, a fourth measurement was made in Bonney Lake Creek 150 ft. upstream from its confluence with Fennel Creek. For segment 16/11//8, only a single BIBI measurement was made near the segment lower bound. These measurements resulted in generally poor BIBI scores for both segments. The highest value, a score of 26, occurred below the spring near the lower bound of segment 16/11//7. The results are presented in Table 5 below.

TABLE 5. BIBI SCORES, FENNEL CREEK STREAMSEGMENTS

16/11//7 Lower bound	16/11//7 Sumner/ Buckley	Bonney Lake Creek	16/11//8 Lower bound
26	16	16	18
18			

PHASE II DECISION BOX

Based on our pre-field assessment, we had already concluded that segments 16/11//1 through 16/11//4 provide good habitat quality and quantity for fish, and these segments are utilized for spawning and rearing by salmon and trout. The stream channel has been subjected to a moderate amount of alteration in segments 16/11//6 and 16/11//7. However, we found habitat quality and quantity in the lower two-thirds of segment 16/11//7 to be surprisingly good even though BIBI scores were in the poor range, and we presume that segment 16/11//6 is not much different. We conclude that the upper third of segment 16/11//7 and all of segment 16/11//8 are in only fair condition. Our Phase II Decision Box for stream segments in Fennel Creek is shown in Table 5.

Table 6. Phase II Decision Box for Fennel Creek

Channel Alteration	Habitat Quality and Quantity: Good	Fair	Poor
Low	16/11//1 16/11//2 16/11//3 16/11//4		16/11//5
Moderate	16/11//6 16/11//7	16/11//8 16/11//10	16/11//11 16/11//12 16/11//13
High		16/11//9	

Canyonfalls Creek, Stream 0410

GENERAL DESCRIPTION

Canyonfalls Creek heads in wetlands in a geological depression on the border between sections 8 and 9 of Township19N, Range 5E, approximately 0.5 mi. south of Victor Falls on Fennel Creek. However, there may not be an open channel here; AES and Beck (1997) reported only a series of wetlands extending downstream around a "fish hook bend" to the west as far as RM 1.8 where the first surface water "daylights." From there the stream flows just north of west to the Troutlodge

Hatchery at about RM 1.0 where the hatchery water intake (water right for 15 cfs) dries the channel. Return water from the hatchery reenters the stream at RM 0.86. The stream then drops through a steep ravine (gradient 17-18 percent) to McCutcheon Road, RM 0.55, where the gradient flattens and the stream turns north to join the Puyallup River at Puyallup RM 16.2 in Township 19 N, Range 5 E, n half of section 7. Stream length is listed as 3.0 miles and drainage area as 1.71 sq. mi. in Williams et al. (1975); however, Huckell/Weinman (1998) record the total drainage area as 3.8 sq. mi.

The headwaters of Canyonfalls Creek are undeveloped and forested down to the Troutlodge Hatchery. However, the Cascadia Planned Community development is planned for the uplands south of Canyonfalls Creek (Huckell/Weinman 1998) and a golf course development may be built on the uplands north of the creek, i.e., between Canyonfalls and Fennel creeks (Subdivision Development and Design et al. 1996). Land use downstream of McCutcheon Road appears to be agricultural and sparse residential.

PHYSICAL HABITAT SURVEY

Access to stream segments in Canyonfalls Creek could not be arranged with the property owners, so no field survey was carried out.

WATER QUALITY MEASUREMENTS

No water quality measurements were made in Canyonfalls Creek. It is our understanding that agents of the nearby Cascadia Planned Community development routinely monitor water quality in segment 16/12//5 upstream of the Troutlodge Hatchery, and that these results will be shared with Pierce County.

FISHES OBSERVED

We know from previous information (see Trotter 2001) that anadromous and migratory fish use Canyonfalls Creek up to McCutcheon Road, the upper bound of segment 16/12//1. These include a substantial run of chum salmon, and small runs of coho salmon, pink salmon (in odd years) and winter steelhead. A small number of chinook salmon also use the stream; six to ten to fish per year have been observed by Puyallup Tribal Fisheries personnel during their spawner surveys in the last three to four years. Larval Pacific lamprey and sculpins have also been reported in segment 16/12//1.

In stream segment 16/12//5, upstream of the the Troutlodge Hatchery, we have reliable reports from nearby residents that non-migratory cutthroat trout and rainbow trout (the latter probably escapees from the hatchery operation) are present in fishable numbers and sizes.

Phase II Decision Box

Canyonfalls Creek flows entirely through private property except at the crossing of McCutcheon Road. The channel has been highly altered in stream segment 16/12//4 owing to operations of the Troutlodge Hatchery, a commercial hatchery operation. Elsewhere, channel alteration appears to be low and habitat quality and quantity appears tp be good.

Our Phase II Decision Box for stream segments in Canyonfalls Creek is shown in Table 7.

Table 7. Phase II Decision Box for Canyonfalls Creek

Channel Alteration	Habitat Quality and Quantity: Good	Fair	Poor
Low	16/12//1 16/12//5	16/12//2	16/12//3 16/12//6
Moderate			
High			16/12//4

Horse Haven Creek, Stream 0589

GENERAL DESCRIPTION

Several different names are associated with this stream and its tributaries. We follow the convention given in Williams et al. (1975), which is also used on the WDFW/WDNR hydrolayer and by SSHIAP.

The Horse Haven mainstem (called Soldiers Home Creek in Thorpe and Stepan 1985) heads at a small 1 to 1.4 acre pond, elevation approximately 440 ft, in Township 18N, Range 5E, section 6 southwest of the Orting Soldiers Home. It drains west then north through a steep gully with an impassable cascade, and emerges on the valley floor near the Soldiers Home where it is joined by tributariess 0592 and 0593. The stream becomes a valley tributary at this point, flowing northwest along the base of the bluff for approximately 2 miles to its confluence with Tributary 0590 (called Lorraine Creek by Pierce Conservation District 2000 but considered the mainstem of Horse Haven Creek by Thorpe and Stepan 1985). Tributary 0590 itself originates at a 10 acre pond, elevation approximately 450 ft, in Township19N, Range 4E, sw 1/4 of sw 1/4 section. 36, then flows west down a steep ravine with an impassiable cascade to the valley floor. There it turns north to join the Horse Haven mainstem. Horse Haven then continues north-northwest to join the Puyallup River at Puyallup RM 20.2 in Township 19 N, Range 4 E, n half of section 25. Horse Haven mainstem stream length is given as 3.3 miles and Tributary 0590 stream length as 1.4 miles inWilliams et al. (1975). Tributaries 0591, 0592,and 0593 are also mapped in Williams et al. (1975) but no stream lengths are given.

The gullies of both the mainstem and Tributary 0590 appear inaccessible and forested (based on the USGS Orting quad revised 1994). However, the headwaters of Tributary 0590 are located in an area designated Master Planned Community on the Pierce County land use map and are within the boundary of the Rainier Terrace Planned Community development (Thorpe and Stepan 1985). The valley floor is a mixed use area of homes and agriculture.

We were not able to obtain access to much of this stream, including the valley segments we were most desirous of surveying based on the pre-field assessment (Trotter 2001). We were only able to reach the stream at a single location in segment 16/20//1 near the upper bound of the segment, and there we made water quality measurements but could not conduct a habitat survey because of the limited access at this location, nor could we find suitable habitat for BIBI collection. So instead, we examined segments16/20//7 and 16/20//8 in the upper reaches of the mainstem, which we entered from the road leading to the Pierce County quarry in Township 18N, Range 5E, section 6.

PHYSICAL HABITAT, SEGMENTS 16/20//7 AND 16/20//8

We descended downslope from the gravel pit road and accessed Horesheaven Creek at approximately the lower bound of segment 16/20//7. The stream here flows within a forested riparian area dominated by conifers and appears relatively undisturbed. The channel is about 4 ft in wetted width with a bankful width estimated at 6 ft, gradient about 2 percent. There is excellect pool-riffle habitat sequences with gravel and cobble substrate. Spawning habitat is ample and, judging from the number of coho parr we observed here (we estimated 30 parr per 100 ft of stream), appears to be in good condition and reasonably well used. Continuing upstream about 200 ft, at a point just west of the gravel pit on an old road grade, we encountered a recently installed storm drain with a riprap overflow funnel that apparently carries runoff from the road above into the creek.

Approximately 500 ft upstream from the stormwater runoff channel, the stream turns west, the valley walls narrow, and channel gradient increases to about 5 percent as the stream ascends the bluff. This is the upper bound of segment 16/20//7. A short spring-fed stream (not mapped) enters here from the south. Above this stream, pool size and water flow in the mainstem channel decrease significantly. Sighting of coho parr also ceased at this point, but we did continue to observe resident cutthroat trout, albeit less frequently (we estimated cutthroat densities to be about 1 to 5 fish per 100 ft of stream). Approximately 500 feet upstream of the seep spring the gradient increased abruptly to 10% to 15%, and fish sightings ceased altogether. This is the upper bound of segment 16/20//8 where we terminated our survey.

WATER QUALITY MEASUREMENTS

Water quality measurements for Horse Haven Creek were taken at the upper bound of segment 16/20//1 and at the lower bound of segment 16/20//7. These measurements are presented in Table 8 below

TABLE 8. WATER QUALITY, HORSE HAVEN CREEK STREAM SEGMENTS

Stream Segment	16/20//1	16/20//7
Dissolved Oxygen, mg/L	8.6	9.7
Turbidity, ntu	2.6	0.1
Conductivity, microsiemens	169	107
pH	7.2	6.8
Water temperature, degrees C	19.3	9.5

These measurements highlight the contrast between the relatively undisturbed, good quality habitat condition of segments near the stream headwaters and the altered channel conditions downstream in the valley floor. Higher turbidity, higher conductivity, and much warmer stream water characterize the valley floor segments.

BIBI Scores

No suitable collection habitat could be found in the accessible length of segment 16/20//1. Therefore, a score of (10) was entered for this segment. On the other hand, segment 16/20//7 produced the highest score of the survey with a value of 38. This was the only stream segment in the entire mid-Puyallup survey to score in the "good" category for Index of Biotic Integrity.

FISHES OBSERVED

From previous information (see Trotter 2001), we know that coho and chum salmon fish use Horse Haven Creek along with resident and possibly sea-run cutthroat trout. However, up to now it was presumed that anadromous and migratory fish use did not extend beyond segment 16/20//2, owing to an impassable culvert at Goltz Road, RM 1.4 (Pierce Conservation District 2000). We can now say with certainty that coho salmon can access the stream as far upstream as RM 3.2 in the mainstem, segment 16/20//8, and probably to at least RM 0.8 of tributary 0590, segment 16/20/2//1. During our survey of the upper segments of the Horse Haven mainstem, we observed juvenile coho (estimated densities about 30 fish per 100 ft of stream) rearing in pools in segment 16/20//7, and resident cutthroat trout (estimated densities 1 to 5 fish per 100 ft of stream) in segment 16/20//8.

Horse Haven Creek was stocked annually with hatchery reared coho salmon fry from 1981 through 1996 (C. Baranski, Washington Department of Fish and Wildlife, personal communication June 29, 2001). The Puyallup Tribe once considered building its own fish hatchery on upper Horse Haven Creek but abandoned the plan due to the ephemeral nature of streamflow in the late summer months (R. Ladley, Puyallup Tribe, personal communication March 19, 2001).

PHASE II DECISION BOX

Although the Horse Haven Creek system is a much larger drainage than Ball Creek, our pre-field and field assessments indicate that land uses and channel alterations have produced about the same effects on habitat quality and quantity in the valley floor stream segments as are found in Ball Creek. We conclude that these valley floor segments, while indeed used by fish, provide only poor to fair habitat quality and quantity. On the other hand, segments near the headwaters, where the stream descends from uplands, exhibit a low level of alteration and provide good habitat quality and quantity for fish.

Our Phase II Decision Box for stream segments in Horse Haven Creek is shown in Table 9.

Table 9. Phase II Decision Box for Horse Haven Creek

Channel Alteration	Habitat Quality and Quantity		
	Good	*Fair*	**Poor**
Low	16/20//5 16/20//6 16/20//7 16/20//8		16/20//9 16/20//10 16/20//11 16/20//12
Moderate	16/20/2//1	16/20//3 16/20//4	16/20//1 16/20//2
High			

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APPENDIX A

Field Data Sheets, Segment Habitat Surveys

APPENDIX B

Photo Sequence, Segment Habitat Survey

Ball Creek

1. Segment 16/10//1, view downstream from 106th St. E. into a private duck pond constructed in the creek at the segment upper bound. A school of about 20 coho salmon fry were observed in this pool.

2. Segment 16/10//2,lower bound, view upstream from 106th St. E.

Fennel Creek

3. Segment 16/11//7, lower bound, view downstream toward segment 16/11//6.

4. Segment 16/11//7, lower bound, view upstream.

5. Left-bank spring pond connected to Fennel Creek 269 ft upstream of segment 16/11//7 lower bound.

6. Man-made rock wier in segment 16/11//7 1927 ft upstream from segment lower bound creates a pool upstream.

7. LWD jam in segment 16/11//7 3743 ft upstream from segment lower bound.

8. View upstream from the survey point pictured in photo 7.

9. Segment 16/11//7, photo taken at upstream side of SR-410 crossing. View is downstream toward the box culvert under the highway.

10. Segment 16/11//7, view of upstream end of culvert under Old Sumner-Buckley Highway.

11. Segment 16/11//7 at Old Sumner-Buckley Highway, view upstream.

12. Segment 16/11//7 at Old Sumner-Buckley Highway, view downstream. This view shows one of two riparian buffer mitigation areas where trees and shrubs have been planted to mitigate for losses due to highway construction.

13. Segment 16/11//7 showing the culvert at Old Sumner-Buckley Highway carrying flow from a near-bankful rain event that occurred on June 11, 2001.

14. Segment 16/11//8, showing riparian condition 830 ft upstream from the segment lower bound.

15. Segment 16/11//8, showing riparian habitat 1500 ft upstream from the segment lower bound.

16. Left-bank tributary entering segment 16/11//8 from ajoining pasture 1530 ft upstream from segment lower bound. This tributary is a straight, ditcvhed channel with a wetted width of 2 ft. It does not appear on maps of the area. View south.

17. A short right-bank tributary entering segment 16/11//'8 2015 ft upstream from the segment lower bound. This stream appears to issue from a wetland situated on the north side of the Fennel Creek channel.

18. Garbage in segment 16/11//8 near Kelly Creek Road approximately 200 ft downstream from the segment upper bound includes an old pesticide/herbicide application sprayer.

19. Bridge over Fennel Creek at Kelly Road approximately 200 ft downstream from segment 16/11//8 upper bound. View upstream.

Horse Haven Creek

20. Segment 16/20//7, upper Horse Haven Creek. Juvenile coho were observed throughout this segment; estimated density 30 coho per 100 lineal ft of stream channel.

APPENDIX C

BIBI Scores

Ball Creek	
Segment 16/10//2	**(10)**
Segment 16/10//3	**No score**
Fennel Creek	
Segment 16/11//7 lower bound	**26, 18**
Segment 16/11//7 Sumner/Buckley	**16**
Bonney Lake Creek	**18**
Segment 16/11//8	**16**
Horse Haven Creek	
Segment 16/20//2	**(10)**
Segment 16/20//7	**38**

APPENDIX H

PUYALLUP TRIBE WATER QUALITY DATA

Fennel Monitoring Program - Analytical & Field Data

		Precipitation (inches) Previous 24hrs	0.05	0.18	0.02	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.08	1.19
FIELD DATA			#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Parameter			*1/30/98*	*2/19/98*	*3/26/98*	*4/22/98*	*5/21/98*	*6/17/98*	*7/22/98*	*8/17/98*	*9/30/98*	*10/21/98*	*11/30/98*	*12/18/98*
Flow (l/s)	Fen-1	McCutcheon Rd.E.	2.15	2.03	2.44	1.97	1.88	2.17	1.96	1.47	2.14	2.35	2.61	2.94
Area (sqft)	Fen-1	McCutcheon Rd.E.	11.10	10.60	12.85	8.55	7.35	4.70	–	–	–	–	–	–
Disch. (CFS)	Fen-1	McCutcheon Rd.E.	23.82	21.54	31.41	16.81	13.81	10.18	–	–	–	–	–	–
D.O. (mg/L)	Fen-1	McCutcheon Rd.E.	12.74	12.13	13.02	11.39	13.47	12.75	12.04	11.95	12.20	12.40	12.48	13.54
Temp. (C)	Fen-1	McCutcheon Rd.E.	7.30	8.80	8.73	11.62	11.28	10.66	13.21	11.98	9.66	7.65	6.14	5.05
Cond. (µs/cm)	Fen-1	McCutcheon Rd.E.	0.141	0.155	0.144	0.168	0.207	0.206	0.211	0.210	0.206	0.021	0.167	0.160
pH	Fen-1	McCutcheon Rd.E.	7.40	7.34	7.02	7.42	6.84	6.97	7.1	7.04	7.14	7.19	6.73	6.95
Turbidity (NTU)	Fen-1	McCutcheon Rd.E.	1.20	0.00	0.00	0.00	0.00	0.00	13.21	0.00	7.40	0.00	22.00	0.30
Redox (millivolts)	Fen-1	McCutcheon Rd.E.	269	321	395	357	435	414	420	489	515	466	548	511
Salinity (ppt)	Fen-1	McCutcheon Rd.E.	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10
LABORATORY DATA			#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Parameter	***Site***	***Description***	*1/30/98*	*2/19/98*	*3/27/98*	*4/22/98*	*5/21/98*	*6/17/98*	*7/22/98*	*8/17/98*	*9/30/98*	*10/21/98*	*11/30/98*	*12/18/98*
Ortho (mg/L)	Fen-1	McCutcheon Rd.E.	0.05	–	–	ND	–	–	–	–	–	ND	–	ND
Total Phos. (mg/L)	Fen-1	McCutcheon Rd.E.	0.12	–	–	0.03	–	–	–	–	–	0.22	–	0.12
Nitrate + Nitrite (mg/L)	Fen-1	McCutcheon Rd.E.	1.4	–	–	1.4	–	–	–	–	–	1.20	–	1.7
TSS (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	2
TDS (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	14
Ammonia (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	ND
FOG / TPH (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	–

1999 Canyon Creek - Analytical & Field Data

FIELD DATA *Parameter*	*Site*	*Description*	#1 5/6/99	#2 6/10/99	#3 6/23/99	#4 8/19/99	#5 8/30/99	#6 10/13/99	#7 12/20/99	#8 1/4/00
D.O. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	11.54	10.40	11.90	10.93	12.37	10.79	12.24	12.30
D.O. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	11.84	11.40	12.41	11.46	12.99	11.96	10.76	11.35
D.O. (mg/L)	Cyn-2-Mouth	Mouth	11.38	10.44	10.55	10.28	11.75	–	–	–
Temp.(C)	Cyn-1-E	East side of McCutcheon Rd.	9.16	11.52	10.36	13.30	10.19	10.31	8.71	8.51
Temp.(C)	Cyn-1-W	West side of McCutcheon Rd.	9.15	11.59	10.39	13.30	10.21	10.34	8.72	8.52
Temp.(C)	Cyn-2-Mouth	Mouth	9.33	11.66	10.27	12.94	10.27	–	–	–
Cond. (µS/cm)	Cyn-1-E	East side of McCutcheon Rd.	231	197	197	199	199	198	191	193
Cond. (µS/cm)	Cyn-1-W	West side of McCutcheon Rd.	231	197	197	199	199	99	194	194
Cond. (µS/cm)	Cyn-2-Mouth	Mouth	231	197	197	198	198	–	–	–
pH	Cyn-1-E	East side of McCutcheon Rd.	7.47	7.51	7.45	7.45	7.57	7.51	7.68	8.02
pH	Cyn-1-W	West side of McCutcheon Rd.	7.56	7.59	7.46	7.48	7.58	7.54	8.02	8.11
pH	Cyn-2-Mouth	Mouth	7.31	7.01	7.08	7.03	7.48	–	–	–
Redox (millivolts)	Cyn-1-E	East side of McCutcheon Rd.	473	395	351	449	369	450	–	–
Redox (millivolts)	Cyn-1-W	West side of McCutcheon Rd.	469	392	355	441	371	450	–	–
Redox (millivolts)	Cyn-2-Mouth	Mouth	435	309	319	344	352	–	–	–
Salinity (ppt)	Cyn-1-E	East side of McCutcheon Rd.	0.1	0.1	0.1	0.1	0.1	0.1	0.09	0.09
Salinity (ppt)	Cyn-1-W	West side of McCutcheon Rd.	0.1	0.0	0.1	0.1	0.1	0.1	0.00	0.09
Salinity (ppt)	Cyn-2-Mouth	Mouth	0.1	0.1	0.1	0.1	0.1	–	–	–

LABORATORY DATA *Parameter*	*site*	*Description*	#1 5/6/99	#2 6/10/99	#3 6/23/99	#4 8/19/99	#5 8/30/99	#6 10/13/99	#7 12/20/99	#8 1/4/00
Ortho (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Ortho (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Ortho (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
Total Phos. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	0.11	–	0.15
Total Phos. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Total Phos. (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
Nitrate + Nitrite (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	2.5	–	2.4
Nitrate + Nitrite (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Nitrate + Nitrite (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
TSS (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	2	–	ND
TSS (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
TSS (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
TDS (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	–		–
TDS (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
TDS (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	2		60
Fecal Coliform (col/100mL)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–
Ammonia	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	0.11		0.11
Ammonia (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–
Ammonia (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–

1999 Fennel Monitoring Program - Analytical & Field Data

FIELD DATA			#1	#2	#3	#4	#5	#6	#6	#7	#8	#9	#10	#11
Parameter			1/27/99	2/25/99	3/24/99	5/6/99	6/10/99	6/24/99	6/28/99	8/9/99	8/30/99	10/14/99	12/20/99	1/4/00
D.O. (mg/L)	Fen-1	McCutcheon Rd.E.	13.93	15.19	11.51	11.81	11.28	10.85	–	10.65	12.16	13.95	11.76	11.06
D.O. (mg/L)	Fen-2	Victor Falls	–	–	11.29	11.27	10.10	–	10.70	10.43	11.67	9.74	14.52	11.77
Temp. (C)	Fen-1	McCutcheon Rd.E	5.63	6.69	9.33	9.49	11.93	11.36	–	13.85	12.15	9.81	7.87	6.83
Temp. (C)	Fen-2	Victor Falls	–	–	9.35	10.01	11.72	–	10.75	14.61	11.63	9.82	7.48	6.25
Cond. (µS/cm)	Fen-1	McCutcheon Rd.E.	158	147	180	201	176	201	–	63	179	172	124	132
Cond. (µS/cm)	Fen-2	Victor Falls	–	–	171	199	173	–	183	183	188	176	111	119
pH	Fen-1	McCutcheon Rd.E	6.62	6.88	7.31	7.20	7.47	7.43	–	7.34	7.65	7.38	7.66	7.51
pH	Fen-2	Victor Falls	–	–	7.04	7.25	6.82	–	7.05	7.02	7.22	7.29	7.44	7.69
Redox (millivolts)	Fen-1	McCutcheon Rd.E.	514	527	352	491	391	363	–	387	461	451	–	–
Redox (millivolts)	Fen-2	Victor Falls	–	–	356	391	377	–	377	436	402	488	–	–
Salinity (ppt)	Fen-1	McCutcheon Rd.E.	0.1	0.1	0.1	0.1	0.1	0.1	–	0.0	0.1	0.1	0.05	0.005
Salinity (ppt)	Fen-2	Victor Falls	–	–	0.1	0.1	0.1	–	0.1	0.1	0.1	0.1	0.04	0.005

LABORATORY DATA			#1	#2	#3	#4	#5	#6	#6	#7	#8	#9	#10	#11
Parameter	Site	Description	1/27/99	2/25/99	3/24/99	5/6/99	6/10/99	6/24/99	6/28/99	8/10/99	8/30/99	10/14/99	12/20/99	1/4/00
Ortho (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	–	–	–	–	–	–	–
Ortho (mg/L)	Fen-2	Victor Falls	–	–	–	–	–	–	–	–	–	–	–	–
Total Phos. (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	0.10	–	0.10	–	–	–	–	0.12	–	0.1
Total Phos. (mg/L)	Fen-2	Victor Falls	–	–	0.08	–	0.10	–	–	–	–	0.11	–	0.09
Nitrate + Nitrite (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	1.3	–	1.2	–	–	–	–	–	–	1.2
Nitrate + Nitrite (mg/L)	Fen-2	Victor Falls	–	–	1.4	–	1.2	–	–	–	–	–	–	1
TSS (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	ND	–	–	–	–	–	–	2.0	–	3
TSS (mg/L)	Fen-2	Victor Falls	–	–	2	–	–	–	–	–	–	ND	–	–
TDS (mg/L)	Fen-1	McCutcheon Rd.E.	–	–		–	–	–	–	–	–	–	–	–
TDS (mg/L)	Fen-2	Victor Falls	–	–	–	–	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Fen-1	McCutcheon Rd.E.	–	–	33	–	38	–	–	–	–	20	–	1,100
Fecal Coliform (col/100mL)	Fen-2	Victor Falls	–	–	45	–	22	–	–	–	–	120	–	300
Ammonia (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	ND	–	ND	–	–	–	–	ND	–	0.05
Ammonia (mg/L)	Fen-2	Victor Falls	–	–	ND	–	ND	–	–	–	–	0.051	–	ND

Canyon Creek - Analytical & Field Data

FIELD DATA			#1	#2	#3	#4	#5	#6	#7	#8	#9
Parameter	*Site*	*Description*	*1/4/00*	*2/7/00*	*2/22/00*	*3/27/00*	*4/20/00*	*6/20/00*	*7/7/00*	*8/23/00*	*12/18/00*
D.O. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	12.30	14.73	10.60	10.34	10.95	12.01	12.45	12.90	13.76
D.O. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	11.35	13.84	12.62	10.94	10.94	13.43	13.17	11.68	12.95
D.O. (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
D.O.%	Cyn-1-E	East side of McCutcheon Rd.	102.1	109.6	88.1	88.5	88.5	104.9	115.4	113.7	–
D.O.%	Cyn-1-W	West side of McCutcheon Rd.	94.9	108.4	103.4	92.2	92.2	113.4	116.1	104.4	–
D.O.%	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	
Temp.(C)	Cyn-1-E	East side of McCutcheon Rd.	8.51	8.96	8.97	9.42	10.40	10.20	11.79	10.12	6.73
Temp.(C)	Cyn-1-W	West side of McCutcheon Rd.	8.52	8.96	8.99	9.42	10.40	10.17	11.81	10.14	6.70
Temp.(C)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Cond. (µs/cm)	Cyn-1-E	East side of McCutcheon Rd.	192.4	194.5	200.5	196.9	197.7	201.0	194.0	196.0	201.0
Cond. (µs/cm)	Cyn-1-W	West side of McCutcheon Rd.	193.7	195.2	200.2	195.8	198.3	270.0	194.0	197.0	201.0
Cond. (µs/cm)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
pH	Cyn-1-E	East side of McCutcheon Rd.	8.11	7.72	8.10	8.16	8.06	7.56	7.38	7.51	7.48
pH	Cyn-1-W	West side of McCutcheon Rd.	8.02	7.91	8.19	8.16	7.96	7.49	7.53	7.48	7.37
pH	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
TDS	Cyn-1-E	East side of McCutcheon Rd.	0.1234	0.1240	0.1279	0.1252	0.1265	0.1286	0.1242	0.1261	–
TDS	Cyn-1-W	West side of McCutcheon Rd.	0.1236	0.1244	0.1286	0.1249	0.1272	0.1318	0.1242	0.1261	–
TDS	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Salinity (ppt)	Cyn-1-E	East side of McCutcheon Rd.	0.09	0.09	0.09	0.09	0.00	0.11	0.10	0.10	0.11
Salinity (ppt)	Cyn-1-W	West side of McCutcheon Rd.	0.09	0.09	0.09	0.09	0.09	0.11	0.10	0.10	0.11
Salinity (ppt)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–

LABORATORY DATA											
Parameter	**site**	**Description**	**01/04/00**	**02/07/00**	**02/22/00**	**03/27/00**	**04/20/00**	**06/20/00**	**07/07/00**	**08/23/00**	**12/18/00**
Ortho (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	–	–	–	–	–	–	0.10	–	–
Ortho (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
Ortho (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Total Phos. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	0.15	–	–	0.13	–	–	0.13	–	–
Total Phos. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
Total Phos. (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Nitrate + Nitrite (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	2.4	–	–	2.3	–	–	2.6	–	–
Nitrate + Nitrite (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
Nitrate + Nitrite (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
TSS (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	ND	–	–	2	–	–	ND	–	–
TSS (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
TSS (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Cyn-1-E	East side of McCutcheon Rd.	60	–	–	5	–	–	20	–	–
Fecal Coliform (col/100mL)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
Fecal Coliform (col/100mL)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–
Ammonia (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	0.11	–	–	0.09	–	–	0.18	–	–
Ammonia (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	–	–	–	–	–	–	–	–	–
Ammonia (mg/L)	Cyn-2-Mouth	Mouth	–	–	–	–	–	–	–	–	–

Fennel Monitoring Program - Analytical & Field Data

FIELD DATA			***#1***	***#2***	***#3***	***#4***	***#5***	***#6***	***#7***	***#8***	***#9***
Parameter			***1/4/00***	***2/22/00***	***3/27/00***	***4/20/00***	***6/60/00***	***7/7/00***	***8/22/00***	***11/16/00***	***12/18/00***
D.O. (mg/L)	Fen-1	McCutcheon Rd.E.	11.06	14.11	9.70	13.69	13.11	11.39	11.08	12.72	14.40
D.O. (mg/L)	Fen-2	Victor Falls	11.77	12.35	11.15	12.88	12.37	13.04	11.61	12.19	6.92
D.O.%	Fen-1	McCutcheon Rd.E.	89.0	108.8	83.9	116.4	113.8	107.0	107.1	97.20	–
D.O.%	Fen-2	Victor Falls	90.3	96.2	89.1	112.9	107.0	112.6	108.7	91.10	–
Temp. (C)	Fen-1	McCutcheon Rd.E	6.83	7.74	9.27	11.30	11.06	12.67	14.07	4.89	4.64
Temp. (C)	Fen-2	Victor Falls	6.25	7.15	8.62	11.38	11.25	12.95	12.78	3.22	4.24
Cond. (µs/cm)	Fen-1	McCutcheon Rd.E.	131.8	142.8	155.7	158.1	174.0	176.0	750.0	175.0	156.0
Cond. (µs/cm)	Fen-2	Victor Falls	119.1	135.8	146.9	150.2	181.0	186.0	191.0	187.0	158.0
pH	Fen-1	McCutcheon Rd.E	7.51	7.74	7.97	7.65	7.46	7.54	7.41	7.62	7.29
pH	Fen-2	Victor Falls	7.69	7.98	7.44	7.60	7.29	7.61	7.47	7.60	12.80
TDS	Fen-1	McCutcheon Rd.E.	0.0839	0.0916	0.0995	0.1012	0.1107	0.1126	0.1480	0.1120	–
TDS	Fen-2	Victor Falls	0.0764	0.0863	0.0942	0.0965	0.1158	0.1917	0.1222	0.1200	–
Salinity (ppt)	Fen-1	McCutcheon Rd.E.	0.01	0.06	0.07	0.07	0.09	0.09	0.03	0.09	0.08
Salinity (ppt)	Fen-2	Victor Falls	0.01	0.06	0.06	0.07	0.09	0.09	0.10	0.10	0.08

LABORATORY DATA			***#1***	***#2***	***#3***	***#4***	***#5***	***#6***	***#7***	***#8***	***#9***
Parameter	***Site***	***Description***	***1/4/00***	***2/22/00***	***3/27/00***	***4/20/00***	***6/20/00***	***7/7/00***	***8/23/00***	***11/16/00***	***12/18/00***
Ortho (mg/L)	Fen-1	McCutcheon Rd.E.	–	–	–	–	–	ND	–	–	–
Ortho (mg/L)	Fen-2	Victor Falls	–	–	–	–	–	ND	–	–	–
Total Phos. (mg/L)	Fen-1	McCutcheon Rd.E.	0.10	–	0.12	–	–	0.05	–	–	–
Total Phos. (mg/L)	Fen-2	Victor Falls	0.09	–	0.19	–	–	0.07	–	–	–
Nitrate + Nitrite (mg/L)	Fen-1	McCutheon Rd.E.	1.2	–	1.5	–	–	1.7	–	–	–
Nitrate + Nitrite (mg/L)	Fen-2	Victor Falls	1.0	–	1.6	–	–	2.0	–	–	–
TSS (mg/L)	Fen-1	McCutcheon Rd.E.	3	–	3	–	–	ND	–	–	–
TSS (mg/L)	Fen-2	Victor Falls	–	–	4	–	–	ND	–	–	–
Fecal Coliform (col/100mL)	Fen-1	McCutcheon Rd.E.	1100	–	45	–	–	75	–	–	–
Fecal Coliform (col/100mL)	Fèn-2	Victor Falls	300	–	620	–	–	100	–	–	–
Ammonia (mg/L)	Fen-1	McCutcheon Rd.E.	0.05	–	ND	–	–	ND	–	–	–
Ammonia (mg/L)	Fen-2	Victor Falls	ND	–	ND	–	–	0.04	–	–	–

Canyon Creek - Analytical & Field Data

Previous 24hr Precipitation in Inches			0.01	trace	0.24	0.00	0.00	0.00	0.00	0.20	0.35	0.00	0.08
FIELD DATA			#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Parameter	***Site***	***Description***	***2/5/01***	***3/12/01***	***3/26/01***	***5/3/01***	***5/22/01***	***6/18/01***	***7/25/01***	***8/21/01***	***9/26/01***	***11/7/01***	***12/5/01***
D.O. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	12.15	13.35	11.66	13.05	11.35	10.85	11.00	12.27	10.93	10.33	11.10
D.O. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	12.02	12.69	11.74	12.09	11.14	10.53	10.88	12.11	10.90	-	-
D.O. (mg/L)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
D.O.%	Cyn-1-E	East side of McCutcheon Rd.	101.8	115.3	108	104.6	103.4	-	102.3	109.5	97.4	-	-
D.O.%	Cyn-1-W	West side of McCutcheon Rd.	100.9	108.6	101.2	104.9	103.0	-	101.7	108.9	97.1	-	-
D.O.%	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Temp.(C)	Cyn-1-E	East side of McCutcheon Rd.	7.73	9.13	8.98	9.42	11.26	11.58	12.54	10.62	10.25	8.02	7.4
Temp.(C)	Cyn-1-W	West side of McCutcheon Rd.	7.72	9.13	8.98	9.43	11.26	11.61	12.57	10.61	10.25	-	-
Temp.(C)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Cond. (µs/cm)	Cyn-1-E	East side of McCutcheon Rd.	211.0	211.0	210.0	213.0	213.0	217.0	220.0	219.0	217.0	213.0	215.0
Cond. (µs/cm)	Cyn-1-W	West side of McCutcheon Rd.	211.0	211.0	210.0	214.0	213.0	217.0	220.0	219.0	217.0	-	-
Cond. (µs/cm)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
pH	Cyn-1-E	East side of McCutcheon Rd.	7.44	7.24	7.40	7.51	7.09	7.30	7.69	7.33	7.82	7.48	7.56
pH	Cyn-1-W	West side of McCutcheon Rd.	7.35	7.29	7.58	7.62	7.41	7.83	7.72	7.39	7.86	-	-
pH	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
TDS	Cyn-1-E	East side of McCutcheon Rd.	0.1350	0.1350	0.1344	0.1363	0.1363	-	0.1408	0.1402	0.1382	-	-
TDS	Cyn-1-W	West side of McCutcheon Rd.	0.1350	0.1350	0.1344	0.1370	0.1363	-	0.1408	0.1402	0.1389	-	-
TDS	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Salinity (ppt)	Cyn-1-E	East side of McCutcheon Rd.	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0
Salinity (ppt)	Cyn-1-W	West side of McCutcheon Rd.	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	-	-
Salinity (ppt)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
LABORATORY DATA													
Parameter	**site**	**Description**											
Total Phos. (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	-	-	0.26	-	-	0.21	-	-	0.25	-	0.23
Total Phos. (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
Total Phos. (mg/L)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	-	-	-	-	-	2.10	-	-	2.7	-	2.42
Nitrate + Nitrite (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (mg/L)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
TSS (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	-	-	ND	-	-	ND	-	-	ND	-	ND
TSS (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
TSS (mg/L)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Fecal Coliform (col/100mL)	Cyn-1-E	East side of McCutcheon Rd.	-	-	2,800	-	-	1	-	-	30	-	4
Fecal Coliform (col/100mL)	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
Fecal Coliform (col/100mL)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Ammonia (mg/L)	Cyn-1-E	East side of McCutcheon Rd.	-	-	ND	-	-	0.08	-	-	0.13	-	0.21
Ammonia (mg/L)	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
Ammonia (mg/L)	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Flow Information													
Parameter	**site**	**Description**											
Area	Cyn-1-E	East side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	3.60 ft²
Area	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	-
Area	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
Flow	Cyn-1-E	East side of McCutcheon Rd.											
Flow	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	2.81 ft/sec
Flow	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-
Discharge	Cyn-1-E	East side of McCutcheon Rd.											
Discharge	Cyn-1-W	West side of McCutcheon Rd.	-	-	-	-	-	-	-	-	-	-	10.12 ft³/sec
Discharge	Cyn-2-Mouth	Mouth	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-

Fennel Monitoring Program - Analytical & Field Data

FIELD DATA			***#1***	***#2***	***#3***	***#4***	***#5***	***#6***	***#7***	***#8***	***#9***	***#10***
Parameter			***2/5/01***	***3/12/00***	***3/26/01***	***5/2/01***	***5/22/01***	***6/18/01***	***7/25/01***	***8/21/01***	***9/26/01***	***12/5/01***
D.O. (mg/L)	Fen-1	McCutcheon Rd	12.93	11.63	11.09	12.08	10.85	10.81	10.10	11.18	10.22	11.10
D.O. (mg/L)	Fen-2	Victor Falls	14.35	12.6	-	-	-	-	-	-	-	-
D.O.%	Fen-1	McCutcheon Rd	103.7	99.9	95.2	105.7	99.8	-	95.7	102.2	92.7	-
D.O.%	Fen-2	Victor Falls	112.7	105.1	-	-	-	-	-	-	-	-
Temp. (C)	Fen-1	McCutcheon	6.28	8.67	8.77	9.78	11.59	11.92	12.96	11.24	11.01	7.4
Temp. (C)	Fen-2	Victor Falls	5.60	8.57	-	-	-	-	-	-	-	-
Cond. (µs/cm)	Fen-1	McCutcheon Rd	149.0	175.0	161.0	153.0	179.0	181.0	187.0	185.0	186.0	215.0
Cond. (µs/cm)	Fen-2	Victor Falls	137.2	179.0	-	-	-	-	-	-	-	-
pH	Fen-1	McCutcheon Rd.E	6.67	7.54	7.55	7.76	7.46	7.82	7.69	7.59	7.25	7.56
pH	Fen-2	Victor Falls	6.55	7.49	-	-	-	-	-	-	-	-
TDS	Fen-1	McCutcheon Rd	0.9540	0.1114	0.1030	0.0979	0.1146	-	0.1197	0.1184	0.1190	-
TDS	Fen-2	Victor Falls	0.0877	0.1146	-	-	-	-	-	-	-	-
Salinity (ppt)	Fen-1	McCutcheon Rd	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Salinity (ppt)	Fen-2	Victor Falls	0.0	0.0	-	-	-	-	-	-	-	-

LABORATORY DATA												
Parameter	***Site***	***Description***										
Ortho (mg/L)	Fen-1	McCutcheon Rd.E.	-	-	-	-	-	-	-	-	-	-
Ortho (mg/L)	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-
Total Phos. (mg/L)	Fen-1	McCutcheon Rd	-	-	0.26	-	-	0.16	-	-	-	-
Total Phos. (mg/L)	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (mg	Fen-1	McCutheon	-	-	-	-	-	1.00	-	-	-	-
Nitrate + Nitrite (mg	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-
TSS (mg/L)	Fen-1	McCutcheon Rd	-	-	4	-	-	4	-	-	-	-
TSS (mg/L)	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-
Fecal Coliform (col/	Fen-1	McCutcheon Rd	-	-	2,200	-	-	38	-	-	-	-
Fecal Coliform (col/	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-
Ammonia (mg/L)	Fen-1	McCutcheon	-	-	ND	-	-	ND	-	-	-	-
Ammonia (mg/L)	Fen-2	Victor Falls	-	-	-	-	-	-	-	-	-	-

Canyon Creek - Analytical & Field Data

Previous 24hr Precipitation in Inches			trace	0.09	0.00	0.71	0.00
FIELD DATA							
Parameter	***Site***	***Description***	***1/17/01***	***1/30/02***	***2/14/02***	***2/21/02***	***2/27/02***
D.O. (mg/L)	Cyn-E	East side of McCutcheon Rd.	16.44	11.15	11.69	11.42	10.81
D.O.%	Cyn-E	East side of McCutcheon Rd.		92.6	95.3	99.9	88.3
Temp.(C)	Cyn-E	East side of McCutcheon Rd.	7.54	7.7	7.15	9.48	7.27
Cond. (µs/cm)	Cyn-E	East side of McCutcheon Rd.	213.0	204.3	83.4	198.9	203.2
pH	Cyn-E	East side of McCutcheon Rd.	9.43	7.92	7.89	7.76	7.95
TDS	Cyn-E	East side of McCutcheon Rd.	0.1363	0.1309	0.1083	0.1277	0.1300
Salinity (ppt)	Cyn-E	East side of McCutcheon Rd.	0.10	0.09	0.08	0.09	0.09
LABORATORY DATA							
Parameter	**site**	**Description**					
Total Phos. (mg/L)	Cyn-E	East side of McCutcheon Rd.					
Nitrate + Nitrite (mg/L)	Cyn-E	East side of McCutcheon Rd.					
TSS (mg/L)	Cyn-E	East side of McCutcheon Rd.					
Fecal Coliform (col/100mL)	Cyn-E	East side of McCutcheon Rd.					
Ammonia (mg/L)	Cyn-E	East side of McCutcheon Rd.					
Flow Information							
Parameter	**site**	**Description**					
Area (ft^2)	Cyn-E	East side of McCutcheon Rd.	4.55	4.80	3.60		3.92
Flow (ft/sec)	Cyn-E	East side of McCutcheon Rd.	7.69	2.42	3.10		2.98
Discharge (ft^3/sec)	Cyn-E	East side of McCutcheon Rd.	34.99	11.62	11.16		11.68

Fennel Monitoring Program - Analytical & Field Data

Previous 24hr Precipitation in Inches			trace	0.09	0.00	0.70	0.00	1.30	trace
FIELD DATA									
Parameter			***1/17/02***	***1/30/02***	***2/14/02***	***2/21/02***	***3/4/02***	***3/11/02***	***4/18/02***
D.O. (mg/L)	Fen-1	McCutcheon Rd.E.	14.12	12.30	13.45	11.79	12.02	11.23	10.50
D.O.%	Fen-1	McCutcheon Rd.E.	-	96.5	102.6	99.6	95.7	92.4	92.0
Temp. (C)	Fen-1	McCutcheon Rd.E	6.22	5.52	4.63	8.10	6.22	7.65	9.36
Cond. (µs/cm)	Fen-1	McCutcheon Rd.E.	160.2	139.4	149.5	128.0	158.0	147.3	148.0
pH	Fen-1	McCutcheon Rd.E	9.02	7.28	6.90	7.42	7.28	7.05	7.02
TDS	Fen-1	McCutcheon Rd.E.	0.1028	0.0885	0.0958	0.0820	0.1000	0.0942	0.0947
Salinity (ppt)	Fen-1	McCutcheon Rd.E.	0.07	0.06	0.06	0.05	0.00	0.00	0.00
LABORATORY DATA									
Parameter	***Site***	***Description***							
Total Phos. (mg/L)	Fen-1	McCutcheon Rd.E.	-	-	-	-	-	-	
Nitrate + Nitrite (mg/L)	Fen-1	McCutheon Rd.E.	-	-	-	-	-	-	
TSS (mg/L)	Fen-1	McCutcheon Rd.E.	-	-	-	-	-	-	
Fecal Coliform (col/100	Fen-1	McCutcheon Rd.E.	-	-	-	-	-	-	
Ammonia (mg/L)	Fen-1	McCutcheon Rd.E.	-	-	-	-	-	-	
Flow Information									
Parameter	***Site***	***Description***							
Area (ft^2)	Fen-1	McCutcheon Rd.E.	9.50	14.88	10.08	18.00	7.92	18.48	23.50
Flow (ft/sec)	Fen-1	McCutheon Rd.E.	1.49	3.57	2.96	3.97	3.25	3.79	7.41
Discharge (ft^3/sec)	Fen-1	McCutcheon Rd.E.	14.20	53.12	29.84	71.46	25.74	70.03	34.65

APPENDIX I

DRAINAGE SERVICE RESPONSE RECORD

ADDRESS ID	STREET ADDRESS	US ZIP CODE	PROBLEM STATUS	PROBLEM TYPE	ACTIVITY DATE	ACTIVITY TYPE
600	10320 229TH AVCT E	98321	Closed with resolution	Flooding over roadway	1997-01-02 00:00:00.000	REFR
1512	10410 190TH AVCT E	98390	Closed with resolution	Flooding on private property	1998-02-20 00:00:00.000	INSP
1512	10410 190TH AVCT E	98390	Closed with resolution	Flooding on private property	1998-02-24 00:00:00.000	INSP
563	10602 130TH AV E	98374	Closed with resolution	Flooding over roadway	1997-01-03 00:00:00.000	REFR
1408	10916 238TH AVE E	98321	Closed with resolution	Floodng related to development	1998-01-09 00:00:00.000	INSP
1373	11000 116TH AV E	98373	Closed with resolution	Block culvert	1997-02-05 00:00:00.000	MNTN
1373	11000 116TH AV E	98373	Closed with resolution	Block culvert	1997-12-01 00:00:00.000	FAXD
3578	11120 172ND ST E	98374	Closed with resolution	Flooding over roadway	1998-12-28 00:00:00.000	REFR
3578	11120 172ND ST E	98374	Closed with resolution	Flooding over roadway	1999-01-05 00:00:00.000	REFR
3578	11120 172ND ST E	98374	Closed with resolution	Flooding over roadway	1999-10-19 10:49:56.380	COM
3578	11120 172ND ST E	98374	Closed with resolution	Flooding over roadway	1999-10-19 10:53:01.506	REFR
5696	11207 172ND ST E	98374	Closed with resolution	Flooding on private property	2000-04-15 00:00:00.000	REIN
3731	11221 172ND ST E	98374	Active problem	Drainage system failure	1999-01-26 00:00:00.000	FAXD
3731	11221 172ND ST E	98374	Active problem	Drainage system failure	1999-01-27 00:00:00.000	REFR
3731	11221 172ND ST E	98374	Active problem	Drainage system failure	1999-02-04 07:34:04.190	REFR
3731	11221 172ND ST E	98374	Active problem	Drainage system failure	1999-02-04 00:00:00.000	REFR
3580	11230 171ST ST E	98374	Active problem	Flooding over roadway	1998-12-29 00:00:00.000	REFR
3580	11230 171ST ST E	98374	Active problem	Flooding over roadway	1999-01-05 00:00:00.000	CALL
3580	11230 171ST ST E	98374	Active problem	Flooding over roadway	1999-01-06 15:38:52.510	REFR
829	11510 65TH ST.C E	98374	Active problem	Drainage system failure	1997-04-24 00:00:00.000	REFR
1177	11520 JENIFER CT. E	98374	Closed with resolution	Flooding on private property	2000-08-01 00:00:00.000	INSP
33	11520 JENNIFER CT E	98374	Closed with resolution	Flooding on private property	1996-06-04 00:00:00.000	INSP
33	11520 JENNIFER CT E	98374	Closed with resolution	Flooding on private property	1996-06-03 00:00:00.000	INSP
446	11700 SHAW RD E	98374	Closed with resolution	Flooding over roadway	1997-01-09 00:00:00.000	INSP
1314	11705 138TH AV E	98374	Active problem	Flooding on private property	1998-03-12 15:20:00.000	REFR
1314	11705 138TH AV E	98374	Active problem	Flooding on private property	1997-10-30 00:00:00.000	FAXD
668	11712 112TH AVCT E	98374	Closed with resolution	Drainage system failure	1999-05-10 10:23:12.340	COM
668	11712 112TH AVCT E	98374	Closed with resolution	Drainage system failure	2000-02-14 00:00:00.000	MNTN
668	11712 112TH AVCT E	98374	Closed with resolution	Drainage system failure	1999-07-13 00:00:00.000	REFR
668	11712 112TH AVCT E	98374	Closed with resolution	Flooding over roadway	1997-02-27 00:00:00.000	REFR
813	11714 110TH AV E	98374	Closed with resolution	Flooding over roadway	1997-01-01 00:00:00.000	REFR
887	11723 136TH AV E	98374	Active problem	Flooding on private property	1997-06-19 00:00:00.000	REFR
1108	11818 193RD AV E	98390	Active problem	Block culvert	1998-03-06 10:20:00.000	INSP
1108	11818 193RD AV E	98390	Active problem	Block culvert	1998-03-12 15:19:00.000	REFR
4294	12216 138th Av E	98374	Active problem	Fill and grade violation	1999-05-24 07:05:27.720	INSP
5235	12300 BLK 194TH ST E	98338	Closed with resolution	Wetland violation	2000-01-12 12:44:11.250	FIRT
1246	12323 132ND AV E	98374	Closed with resolution	Drainage system failure	1998-03-06 10:48:00.000	MNTN
1246	12323 132ND AV E	98374	Closed with resolution	Drainage system failure	1997-10-30 00:00:00.000	FAXD
1310	12324 TATOOSH RD E	98374	Closed with resolution	Block culvert	1998-03-11 07:48:00.000	MNTN
1310	12324 TATOOSH RD E	98374	Closed with resolution	Block culvert	1997-10-30 00:00:00.000	FAXD
1259	12344 TATOOSH RD E	98374	Closed with resolution	Drainage system failure	1998-03-06 11:02:00.000	MNTN
1259	12344 TATOOSH RD E	98374	Closed with resolution	Drainage system failure	1997-10-30 00:00:00.000	FAXD
1261	12406 TATOOSH RD E	98374	Closed with resolution	Flooding over roadway	1998-03-11 07:43:00.000	MNTN
1261	12406 TATOOSH RD E	98374	Closed with resolution	Flooding over roadway	1997-10-30 00:00:00.000	FAXD
3648	12410 143RD AV E	98374	Closed with resolution	Flooding on private property	1999-01-04 00:00:00.000	CALL
3648	12410 143RD AV E	98374	Closed with resolution	Flooding on private property	1998-12-30 00:00:00.000	REFR
5513	12609 230th St E	98338	Closed with resolution	Fill and grade violation	2000-03-30 15:39:22.940	FIRT
604	12709 117TH STCT E	98374	Closed with resolution	Flooding over roadway	1997-01-02 00:00:00.000	FAXD
5133	12913 116 stct e	98374	Active problem	Block ditch - private	1999-12-02 08:36:54.556	REFR

610	13016 109TH STCT E	98374	Closed without resolution	Flooding on private property	1997-01-03 00:00:00.000	REFR
610	13016 109TH STCT E	98374	Closed without resolution	Flooding on private property	1997-01-03 00:00:00.000	REFR
424	13108 129TH AV E	98374	Closed with resolution	Flooding over roadway	1997-01-10 00:00:00.000	CALL
424	13108 129TH AV E	98374	Closed with resolution	Flooding over roadway	1997-01-04 00:00:00.000	FAXD
891	13124 PIONEER WAY E	98372	Closed with resolution	Block ditch - public	1997-06-26 00:00:00.000	REFR
891	13124 PIONEER WAY E	98372	Closed with resolution	Block ditch - public	1997-07-15 00:00:00.000	MNTN
918	13124 E PIONEER AV	98372	Active problem	Block culvert	1997-08-14 00:00:00.000	REFR
918	13124 E PIONEER AV	98372	Active problem	Block culvert	1997-09-10 00:00:00.000	INSP
918	13124 E PIONEER AV	98372	Active problem	Block culvert	1999-04-21 08:33:44.070	COM
1925	13216 124TH STCT E	98374	Closed with resolution	Block culvert	1998-06-02 14:14:00.000	CALL
1251	13318 145TH ST E	98390	Closed with resolution	Block ditch - public	1997-10-30 00:00:00.000	FAXD
1251	13318 145TH ST E	98390	Closed with resolution	Block ditch - public	1998-11-13 00:00:00.000	MNTN
415	13407 80TH ST E	98372	Active problem	Drainage system failure	1997-03-25 00:00:00.000	REFR
415	13407 80TH ST E	98372	Active problem	Drainage system failure	1997-03-25 00:00:00.000	REFR
5232	13611 146th Av E	98360	Active problem	Septic/drainfield problems	2000-02-03 08:18:03.800	FIRT
5232	13611 146th Av E	98360	Active problem	Septic/drainfield problems	2000-03-04 08:18:13.520	SIRT
592	13807 OLD MILITARY RD E	98374	Closed without resolution	Flooding on private property	1997-02-28 00:00:00.000	INSP
4956	13807 Military Rd E	98374	Active problem	Flooding on private property	1999-10-22 15:35:29.000	REFR
616	14123 80TH ST E	98372	Closed without resolution	Flooding on private property	1997-01-02 00:00:00.000	CALL
4568	14224 Pioneer Wy E	98372	Active problem	Fill and grade violation	1999-08-17 09:34:51.060	FIRT
4568	14224 Pioneer Wy E	98372	Active problem	Fill and grade violation	2000-02-09 14:32:02.130	COM
4694	14313 80th St E	98372	Active problem	Fill and grade violation	2000-01-19 16:20:03.120	FIRT
4694	14313 80th St E	98372	Active problem	Fill and grade violation	2000-02-11 14:48:20.350	COM
4694	14313 80th St E	98372	Active problem	Wetland violation	1999-10-22 09:41:25.210	FIRT
4689	14319 80th St E	98372	Closed with resolution	Fill and grade violation	2000-04-14 09:24:09.640	INSP
4689	14319 80th St E	98372	Closed with resolution	Fill and grade violation	2000-01-19 16:04:45.750	FIRT
4689	14319 80th St E	98372	Closed with resolution	Fill and grade violation	2000-03-08 15:51:38.840	REIN
4689	14319 80th St E	98372	Closed with resolution	Fill and grade violation	2000-02-11 13:41:05.470	COM
4689	14319 80th St E	98372	Active problem	Wetland violation	1999-10-22 09:46:13.460	FIRT
5123	14320 Pioneer WY	98372	Active problem	Block culvert	1999-12-07 12:17:37.640	COM
5123	14320 Pioneer WY	98372	Active problem	Block culvert	1999-11-30 14:53:40.143	REFR
1855	14508 136TH AV E	98374	Active problem	Fill and grade violation	1998-05-22 13:44:00.000	LTTR
1855	14508 136TH AV E	98374	Active problem	Fill and grade violation	1998-05-30 13:44:00.000	FIRT
1855	14508 136TH AV E	98374	Active problem	Fill and grade violation	1998-05-22 13:44:00.000	LTTR
1855	14508 136TH AV E	98374	Active problem	Fill and grade violation	1998-05-22 13:45:00.000	LTTR
1855	14508 136TH AV E	98374	Active problem	Fill and grade violation	1998-09-15 15:59:00.000	LTTR
1855	14508 136TH AV E	98374	Closed with resolution	Wetland violation	1998-08-21 14:47:00.000	FIRT
1855	14508 136TH AV E	98374	Closed with resolution	Wetland violation	1998-08-22 14:46:00.000	TIRT
1855	14508 136TH AV E	98374	Closed with resolution	Wetland violation	1998-09-10 10:13:00.000	LTTR
573	14516 80TH ST E	98372	Active problem	Flooding over roadway	1997-01-06 00:00:00.000	CALL
573	14516 80TH ST E	98372	Active problem	Flooding over roadway	1997-01-06 00:00:00.000	CALL
573	14516 80TH ST E	98372	Active problem	Flooding over roadway	1997-03-27 00:00:00.000	REFR
573	14516 80TH ST E	98372	Active problem	Flooding over roadway	1997-11-25 00:00:00.000	REFR
5329	14608 136th Av E	98374	No Problem	Fill and grade violation	2000-02-17 10:21:02.160	FIRT
664	14620 80TH ST E	98372	Closed without resolution	Flooding on private property	1996-12-30 00:00:00.000	REFR
664	14620 80TH ST E	98372	Closed without resolution	Flooding on private property	1996-12-31 00:00:00.000	REFR
664	14620 80TH ST E	98372	Closed without resolution	Flooding on private property	1997-04-01 00:00:00.000	INSP

2791	14801 128TH ST E	98374	Active problem	Fill and grade violation	1998-12-07 09:12:22.090	FIRT
2791	14801 128TH ST E	98374	Active problem	Fill and grade violation	1999-01-06 09:09:55.336	SIRT
2791	14801 128TH ST E	98374	Active problem	Fill and grade violation	1999-02-12 14:07:14.970	ISCD
2791	14801 128TH ST E	98374	Active problem	Fill and grade violation	1999-03-31 10:40:32.240	COM
2791	14801 128TH ST E	98374	Active problem	Septic/drainfield problems	1999-03-05 10:11:10.510	FIRT
2791	14801 128TH ST E	98374	Active problem	Septic/drainfield problems	1999-04-19 14:21:47.180	SIRT
2791	14801 128TH ST E	98374	Active problem	Septic/drainfield problems	1999-04-20 14:19:32.793	TIRT
2791	14801 128TH ST E	98374	Active problem	Septic/drainfield problems	1999-04-29 14:19:33.806	TIRT
877	15003 134TH AV E	98374	Active problem	Drainage system failure	1997-06-11 00:00:00.000	REFR
5319	15312 106 st e	98374	Closed with resolution	Block culvert	2000-01-21 08:09:18.883	REFR
5319	15312 106 st e	98374	Closed with resolution	Block culvert	2000-05-31 07:17:31.740	COM
4246	15612 116th St E	98374	Active problem	Wetland violation	2000-06-12 14:39:46.310	FIRT
4246	15612 116th St E	98374	Active problem	Wetland violation	2000-07-24 17:41:24.350	SENT
1209	15807 134TH AV E	98374	Closed without resolution	Drainage system failure	1997-12-23 00:00:00.000	CALL
2708	15818 136TH AVCT E	98374	Closed with resolution	Flooding on private property	1998-10-15 00:00:00.000	CALL
3168	16100 224TH ST E	98338	Closed with resolution	Flooding over roadway	1998-11-25 00:00:00.000	FAXD
3168	16100 224TH ST E	98338	Closed with resolution	Flooding over roadway	1998-12-03 00:00:00.000	MNTN
4580	16110 89 ST E	98390	Active problem	Drainage system failure	1999-07-27 16:08:32.500	REFR
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-02-23 00:00:00.000	REFR
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-03-05 00:00:00.000	REFR
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-03-06 00:00:00.000	REFR
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-04-06 00:00:00.000	MNTN
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-12-03 11:45:10.200	REIN
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-12-02 00:00:00.000	CALL
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-11-30 00:00:00.000	REIN
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-11-30 00:00:00.000	INSP
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-12-09 14:15:46.870	REFR
1583	16315 86TH ST E	98390	Closed with resolution	Block ditch - public	1998-12-02 00:00:00.000	REFR
3583	16816 114TH AVCT E	98374	Closed with resolution	Flooding over roadway	1998-12-30 00:00:00.000	REFR
3583	16816 114TH AVCT E	98374	Closed with resolution	Flooding over roadway	1999-01-05 00:00:00.000	CALL
3583	16816 114TH AVCT E	98374	Closed with resolution	Flooding over roadway	1999-01-06 15:47:59.850	REFR
3583	16816 114TH AVCT E	98374	Closed with resolution	Flooding over roadway	1999-10-19 10:56:57.880	COM
510	17000 110TH AV E	98374	Closed with resolution	Flooding over roadway	1997-02-27 00:00:00.000	CALL
510	17000 110TH AV E	98374	Closed with resolution	Flooding over roadway	1997-09-30 00:00:00.000	INSP
3590	17003 113TH AVCT E	98374	Active problem	Flooding over roadway	1998-12-30 00:00:00.000	REFR
3590	17003 113TH AVCT E	98374	Active problem	Flooding over roadway	1999-01-05 00:00:00.000	REFR
3587	17008 110TH AVCT E	98374	Active problem	Flooding over roadway	1998-12-30 00:00:00.000	REFR
3587	17008 110TH AVCT E	98374	Active problem	Flooding over roadway	1999-01-05 00:00:00.000	REFR
2056	17010 126TH AV E	98374	Active problem	Fill and grade violation	1998-06-25 14:05:00.000	LTTR
2056	17010 126TH AV E	98374	Active problem	Fill and grade violation	1998-07-03 14:05:00.000	FIRT
2056	17010 126TH AV E	98374	Active problem	Fill and grade violation	1998-06-25 14:05:00.000	LTTR
2056	17010 126TH AV E	98374	Active problem	Fill and grade violation	1998-09-24 08:30:00.000	LTTR
2056	17010 126TH AV E	98374	Active problem	Wetland violation	1998-08-24 14:01:00.000	FIRT
2056	17010 126TH AV E	98374	Active problem	Wetland violation	1998-09-01 14:02:00.000	SIRT
2056	17010 126TH AV E	98374	Active problem	Wetland violation	1998-08-24 14:02:00.000	LTTR
251	17217 92 ST E	98390	Closed with resolution	Flooding on private property	1997-02-10 00:00:00.000	INSP
984	17217 92ND ST E	98390	Closed with resolution	Flooding on private property	1997-09-18 00:00:00.000	INSP
984	17217 92ND ST E	98390	Closed with resolution	Flooding on private property	1997-10-29 00:00:00.000	INSP
5058	18001 92nd St E	98390	Active problem	Fill and grade violation	2000-01-11 12:56:54.600	REFR
127	18225 95TH -LOOP ST E	98390	Closed with resolution	Floodng related to development	1996-11-22 00:00:00.000	INSP

4670	19409 Orting Kapowsin Hwy E	98360	Active problem	Fill and grade violation	1999-09-28 10:47:30.660	PSWK
4670	19409 Orting Kapowsin Hwy E	98360	Active problem	Fill and grade violation	1999-11-02 10:54:01.350	REIN
1312	19510 82ND STCT E	98390	Closed with resolution	Block culvert	1998-02-05 00:00:00.000	MNTN
1312	19510 82ND STCT E	98390	Closed with resolution	Block culvert	1997-10-30 00:00:00.000	FAXD
4528	19611 132nd AvCt E	98338	Closed with resolution	Septic/drainfield problems	1999-07-27 12:19:27.270	COM
3757	19915 132ND AV E	98338	Closed with resolution	Septic/drainfield problems	1999-02-12 08:15:22.210	FIRT
366	20218 108TH ST E	98390	Active problem	Flooding on private property	1997-01-07 00:00:00.000	REFR
180	20220 CHURCH LAKE RD E	98390	Closed with resolution	Block culvert	1996-12-18 00:00:00.000	REFR
180	20220 CHURCH LAKE RD E	98390	Closed with resolution	Block culvert	1999-01-27 00:00:00.000	INSP
180	20220 CHURCH LAKE RD E	98390	Closed with resolution	Block culvert	1999-02-11 00:00:00.000	REFR
180	20220 CHURCH LAKE RD E	98390	Closed with resolution	Block culvert	1999-02-26 00:00:00.000	REIN
180	20220 CHURCH LAKE RD E	98390	Closed with resolution	Block culvert	1999-08-19 07:16:10.020	COM
3726	20302 127 STCT E	98390	Active problem	Drainage system failure	1999-01-22 00:00:00.000	FAXD
3726	20302 127 STCT E	98390	Active problem	Drainage system failure	1999-02-04 07:40:05.770	REFR
6038	20324 117TH ST E	98390	Active problem	Block culvert	2000-07-31 00:00:00.000	REFR
3743	20409 117TH ST E	98390	Closed with resolution	Flooding on private property	1999-01-28 15:15:06.760	CALL
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	1999-04-29 00:00:00.000	CALL
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	1999-06-08 10:11:10.340	COM
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	1999-09-17 14:40:10.250	COM
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	1999-09-20 08:10:48.740	REFR
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	1999-09-20 08:12:39.256	REFR
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	2000-04-14 11:24:44.723	REFR
4353	20501 123 STCT E	98390	Active problem	Drainage system failure	2000-01-13 11:26:10.200	REFR
2918	20516 124TH STCT E	98390	Closed with resolution	Fill and grade violation	1998-11-30 10:45:22.690	FIRT
2918	20516 124TH STCT E	98390	Closed with resolution	Fill and grade violation	1998-12-30 10:45:41.156	SIRT
2918	20516 124TH STCT E	98390	Closed with resolution	Fill and grade violation	1999-04-28 08:32:35.470	COM
2918	20516 124TH STCT E	98390	Closed with resolution	Fill and grade violation	1999-08-19 11:05:38.190	INSP
3717	20606 108TH ST E	98390	Active problem	Flooding on private property	1999-01-19 00:00:00.000	CALL
2899	20704 BONANZA DR	98390	Active problem	Septic/drainfield problems	1998-11-10 13:04:00.000	FIRT
2899	20704 BONANZA DR	98390	Active problem	Septic/drainfield problems	1998-12-10 13:02:00.000	SIRT
48	20716 131ST AVE E	98338	Closed without resolution	Flooding on private property	1996-06-05 00:00:00.000	REFR
48	20716 131ST AVE E	98338	Closed without resolution	Flooding on private property	1997-10-01 00:00:00.000	CALL
4736	21214 128th StCt E	98390	Closed with resolution	Septic/drainfield problems	1999-10-22 10:36:21.730	FIRT
268	21411 JANSKY RD E	98338	Active problem	Block ditch - public	1996-12-30 00:00:00.000	REFR
758	21531 SR 410 E	98321	Closed without resolution	Flooding on private property	1997-01-03 00:00:00.000	REFR
2554	22023 CONNELLS PRAIRIE RD E	98321	Active problem	Wetland violation	1998-09-24 12:09:00.000	LTTR
2554	22023 CONNELLS PRAIRIE RD E	98321	Active problem	Wetland violation	1998-10-02 12:09:00.000	FIRT
2554	22023 CONNELLS PRAIRIE RD E	98321	Active problem	Wetland violation	1998-09-24 12:09:00.000	LTTR
2554	22023 CONNELLS PRAIRIE RD E	98321	Active problem	Wetland violation	1998-09-24 12:11:00.000	LTTR
3022	22027 CONNELLS PRAIRIE RD E	98321	Active problem	Fill and grade violation	1998-11-20 15:59:00.000	FIRT
3022	22027 CONNELLS PRAIRIE RD E	98321	Active problem	Fill and grade violation	1998-12-20 15:58:00.000	SIRT
4132	22716 149TH AV E	98338	Active problem	Floodng related to development	1998-12-07 00:00:00.000	CALL
4132	22716 149TH AV E	98338	Active problem	Floodng related to development	1999-03-30 00:00:00.000	REFR
4132	22716 149TH AV E	98338	Active problem	Floodng related to development	1999-07-01 00:00:00.000	FIRT
706	22807 ENTWHISTLE RD	98321	Closed with resolution	Flooding on private property	1997-01-02 00:00:00.000	REFR
756	22807 ENTWHISTLE RD	98321	Active problem	Floodng related to development	1997-01-02 00:00:00.000	REFR
1014	22816 SR 410 E	98390	Closed with resolution	Block culvert	1997-08-29 00:00:00.000	INSP
188	22900 ENTWISTLE RD E	98390	Closed with resolution	Block culvert	1997-01-08 00:00:00.000	REFR
188	22900 ENTWISTLE RD E	98390	Closed with resolution	Block culvert	1997-11-25 00:00:00.000	RPAR

1195	2326 CHEROKEE BLVD	98374	Closed with resolution	Drainage system failure	1997-10-31 00:00:00.000	CALL
1195	2326 CHEROKEE BLVD	98374	Closed with resolution	Drainage system failure	1997-10-31 00:00:00.000	CALL
311	23313 96TH ST E	98321	Closed with resolution	Block culvert	1996-12-30 00:00:00.000	CALL
261	23616 108TH STCT E	98321	Closed with resolution	Flooding over roadway	1998-09-17 14:33:00.000	LTTR
261	23616 108TH STCT E	98321	Closed with resolution	Flooding over roadway	1998-09-25 14:33:00.000	FIRT
261	23616 108TH STCT E	98321	Closed with resolution	Flooding over roadway	1998-09-25 14:33:00.000	FIRT
261	23616 108TH STCT E	98321	Closed with resolution	Flooding over roadway	1997-01-01 00:00:00.000	CALL
261	23616 108TH STCT E	98321	Closed with resolution	Flooding over roadway	1997-01-02 00:00:00.000	FAXD
1992	24207 ORVILLE RD E	98360	Active problem	Wetland violation	1998-06-12 10:42:00.000	LTTR
1992	24207 ORVILLE RD E	98360	Active problem	Wetland violation	1998-06-20 10:42:00.000	FIRT
1992	24207 ORVILLE RD E	98360	Active problem	Wetland violation	1998-06-12 10:42:00.000	LTTR
1646	24210 ORVILLE RD E	98360	Closed with resolution	Fill and grade violation	1999-06-09 08:04:03.830	TIRT
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1998-04-24 13:44:00.000	LTTR
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1998-05-02 14:50:00.000	FIRT
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1998-09-11 09:10:00.000	SIRT
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1998-04-24 14:50:00.000	LTTR
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1999-04-12 12:19:28.563	TIRT
1646	24210 ORVILLE RD E	98360	Active problem	Wetland violation	1999-04-12 12:19:28.563	TIRT
1586	4501 90TH AV E	98371	Active problem	Septic/drainfield problems	1998-11-09 16:21:00.000	FIRT
1586	4501 90TH AV E	98371	Active problem	Septic/drainfield problems	1998-12-09 16:20:00.000	SIRT
3834	4505 FREEMAN RD E	98371	Closed with resolution	Flooding on private property	1999-02-01 00:00:00.000	REFR
3834	4505 FREEMAN RD E	98371	Closed with resolution	Flooding on private property	1999-02-05 00:00:00.000	INSP
448	4802 FREEMAN RD E	98371	Closed with resolution	Block culvert	1997-01-02 00:00:00.000	FAXD
466	4917 FREEMAN RD E	98371	Closed with resolution	Floodng related to development	1997-01-02 00:00:00.000	REFR
466	4917 FREEMAN RD E	98371	Closed with resolution	Floodng related to development	1997-02-20 00:00:00.000	INSP
4825	5019 85th Av E	98371	Active problem	Fill and grade violation	1999-10-14 06:41:40.530	PHOT
4825	5019 85th Av E	98371	Active problem	Fill and grade violation	1999-12-28 10:32:07.040	COM
4825	5019 85th Av E	98371	Active problem	Wetland violation	2000-03-30 09:26:18.660	CALL
4825	5019 85th Av E	98371	Active problem	Wetland violation	2000-06-13 15:02:08.570	FIRT
835	6601 114TH AV E	98372	Closed with resolution	Drainage system failure	1997-04-24 00:00:00.000	REFR
4452	7214 River Rd E	98371	Active problem	Septic/drainfield problems	1999-06-28 00:00:00.000	FIRT
4452	7214 River Rd E	98371	Active problem	Septic/drainfield problems	1999-08-01 09:45:20.013	SIRT
4452	7214 River Rd E	98371	Active problem	Septic/drainfield problems	1999-08-01 09:50:19.370	SIRT
2705	7312 153RD AV E	98390	Closed with resolution	Septic/drainfield problems	1998-11-12 13:32:00.000	FIRT
4207	7602 171st AvCt E	98390	Closed with resolution	Fill and grade violation	1999-06-24 14:14:01.690	INSP
4207	7602 171st AvCt E	98390	Closed with resolution	Fill and grade violation	1999-08-26 14:47:13.620	INSP
4316	7814 176th Av E	98390	Active problem	Fill and grade violation	1999-06-14 13:09:31.150	FIRT
4316	7814 176th Av E	98390	Active problem	Fill and grade violation	1999-06-18 13:30:03.950	ISCD
4692	7905 143rd AvCt E	98372	Active problem	Fill and grade violation	2000-01-19 16:32:27.470	FIRT
4692	7905 143rd AvCt E	98372	Active problem	Fill and grade violation	2000-02-11 13:19:33.350	COM
4692	7905 143rd AvCt E	98372	Active problem	Wetland violation	1999-10-22 09:44:40.140	FIRT
472	7910 142ND AV E	98372	Closed with resolution	Flooding on private property	1997-01-02 00:00:00.000	CALL
3356	8319 49TH ST E	98371	Active problem	Flooding on private property	1998-12-02 00:00:00.000	INSP
68	8406 RIVERSIDE DR E	98390	Closed with resolution	Drainage system failure	1996-07-02 00:00:00.000	INSP
68	8406 RIVERSIDE DR E	98390	Closed with resolution	Drainage system failure	1996-07-02 00:00:00.000	REFR
68	8406 RIVERSIDE DR E	98390	Closed with resolution	Drainage system failure	1996-07-11 00:00:00.000	INSP
68	8406 RIVERSIDE DR E	98390	Closed with resolution	Drainage system failure	1996-07-12 00:00:00.000	REFR
68	8406 RIVERSIDE DR E	98390	Closed with resolution	Drainage system failure	1996-07-12 00:00:00.000	INSP
606	9003 VALLEY AV E	98371	Closed with resolution	Flooding over roadway	1997-01-02 00:00:00.000	REFR

5059	9202	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:56:00.500	REFR
5060	9206	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:55:09.090	REFR
5061	9212	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:54:24.550	REFR
5062	9302	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:53:38.900	REFR
5063	9310	180th Ave E	98390	Active problem	Fill and grade violation	2000-01-11 12:52:37.830	REFR
5064	9316	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:51:48.720	REFR
5065	9322	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:50:55.990	REFR
5066	9404	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:50:05.410	REFR
5070	9408	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:48:45.330	REFR
5071	9412	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:47:46.280	REFR
5072	9416	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:45:51.870	REFR
5073	9420	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:45:05.240	REFR
5074	9502	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:44:18.940	REFR
5075	9506	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:43:37.360	REFR
5076	9510	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:42:33.370	REFR
5077	9518	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:41:40.420	REFR
5078	9526	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:40:03.970	REFR
5079	9604	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:38:59.710	REFR
4361	9609	181ST AV E	98390	Active problem	Floodng related to development	1999-06-07 00:00:00.000	FIRT
4361	9609	181ST AV E	98390	Active problem	Floodng related to development	1999-06-08 15:25:56.860	REFR
5080	9610	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:36:58.210	REFR
5081	9616	180th Av E	98390	Active problem	Fill and grade violation	2000-01-11 12:33:32.900	REFR

APPENDIX J

CAPITAL IMPROVEMENT PROJECTS PRIORITIZATION, ESTIMATES, AND SKETCHES

CIP Prioritization Worksheet

CIP-23-A1-RF01	Subbasin: Alderton Creek - A1	
Location: Pioneer Way between 142nd Ave Ct E and the railroad		
Description: Pioneer Way Conveyance Improvements		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	15	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding - solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	5	
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	5	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	15	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	65	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	12	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	20	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)		
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	52	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)		
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)		
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)		
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	5	LOW

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	10	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)		
c. Provides public education opportunities (high = 10, medium = 7, low = 3)		
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	10	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	**132**	**LOW**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Neighborhood Flooding along Pioneer Way
Project Number: CIP-23-A1-RF01
Project Type: Drainage Conveyance Improvement
Sub-Basin: A-1

Existing Conditions: Water ponds at the side of the road along Pioneer Way from 142nd Avenue Court E to the BNSF railroad crossing but does not go over the roadway. There are no roadside ditches at this location. Runoff pools in low spots and infiltrates. This is a potential site for using LID techniques since relatively minor ponding currently infiltrates.

Analysis: The Pierce County drainage inventory was used to locate existing drainage pathways. Field visits were made to evaluate options on site.

Proposed Solution/ Project Description Construct bioretention swales along the north side of Pioneer Way to contain and infiltrate runoff. Include an overview route for high flows that is directed east down Pioneer Way and connects to the existing drainage path on the other side of the railroad. This will require 12-inch culverts under driveways and under the railroad perched at the overflow level of the swales.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

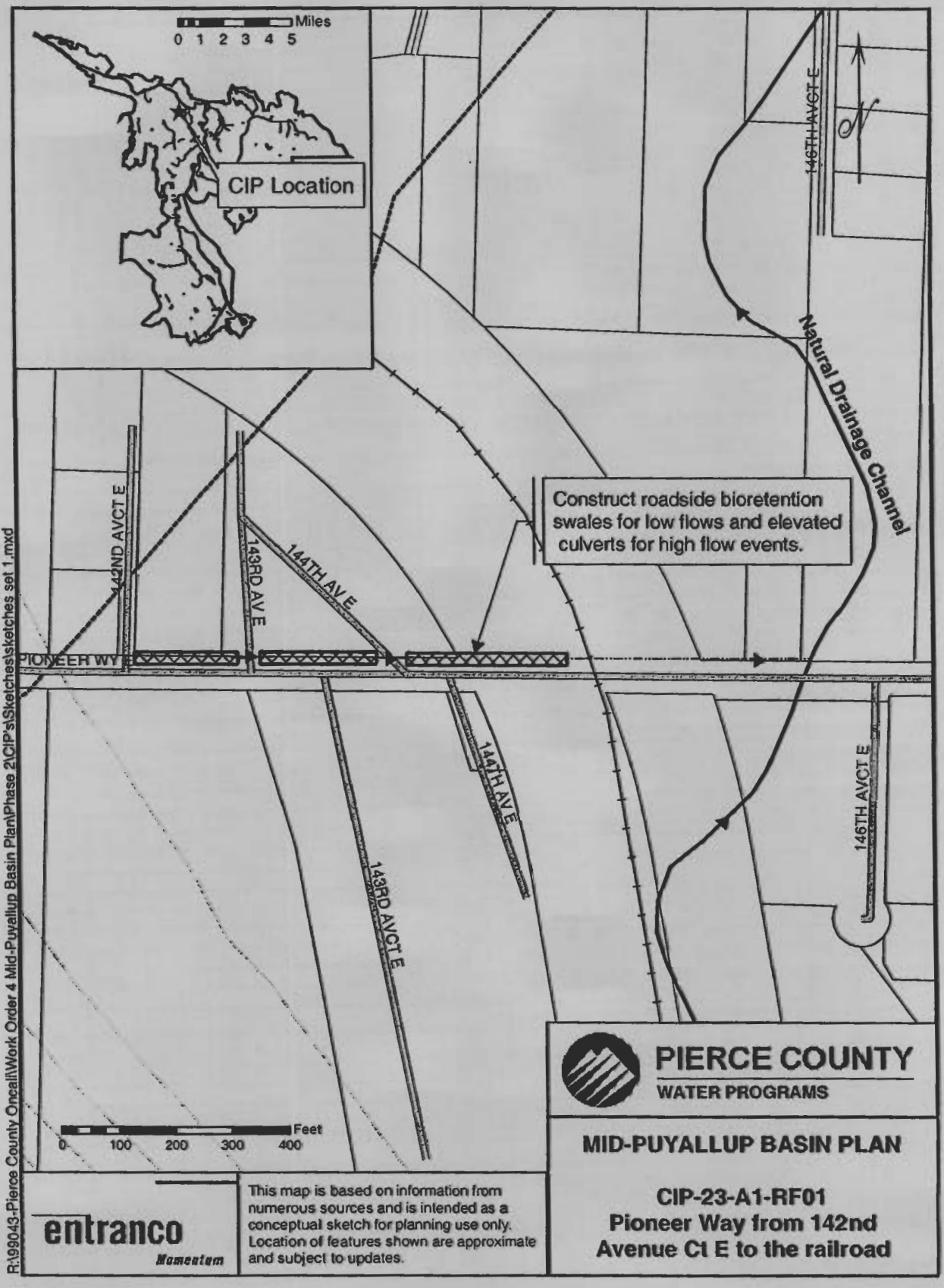
Item	Unit	Unit Cost	Quantity	Cost
12" Driveway Culvert	LF	$ 65	30	$ 1,950
12" Culvert under RR	LF	$ 65	20	$ 1,300
Bioswale Excavation	CY	$ 35	615	$ 21,525
Bioswale Grass Mix	LB	$ 42	7.4	$ 311
Topsoil Type A	CY	$ 30	246	$ 7,380
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 32,466
			Contingency (20%)	$ 6,493
			Sub-Total	$ 38,959
			Engineering and Administration (35%)	$ 13,636
			Total Land Costs	$ -
			*** Project Cost**	$ 52,595

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
146TH AVCT E
Natural Drainage Channel
Construct roadside bioretention swales for low flows and elevated culverts for high flow events.
142ND AVCT E
143RD AV E
144TH AV E
PIONEER WY
147TH AV E
143RD AVCT E
146TH AVCT E
Feet
0 100 200 300 400
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-A1-RF01
Pioneer Way from 142nd Avenue Ct E to the railroad
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.

CIP Prioritization: Worksheet

Project ID: CIP-23-V01-RST01	Subbasin: Van Ogles Creek - VO1	
Location: Mouth of Van Ogles Creek to 92nd Street East		
Description: Van Ogles Creek Restoration		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding - solves an existing problem (select & score one)		
Prevents/reduces annual flooding (high = 20, medium = 13, low = 7)		
Prevents/reduces flooding every 1 to 5 years (high = 15, medium = 10, low = 5)		
Prevents/reduces flooding every 5 to 25 years (high = 10, medium = 7, low = 3)	7	
Prevents/reduces flooding less than one in 25 years (high = 5, medium = 3, low = 1)		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)		
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	10	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	30	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	7	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)	13	
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)	7	
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	7	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	30	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	30	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	114	MEDIUM

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	30	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)	20	
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	10	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	10	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)	5	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	90	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	7	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	7	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	7	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	7	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	28	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**262**	MEDIUM

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Van Ogles Creek Riparian Restoration
Project Number: CIP-23-VO1-RST01
Project Type: Water Quality and Habitat enhancement
Sub-Basin: VO-1

Existing Conditions: The riparian corridor lacks vegetation.

Analysis: Field assessment.

Proposed Solution/ Project Description Replant riparian corridor, install fencing to restrict live stock where needed, install structures to stabilize banks.

Design Assumptions: It is assumed that access to the properties containing riparian area will be available.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

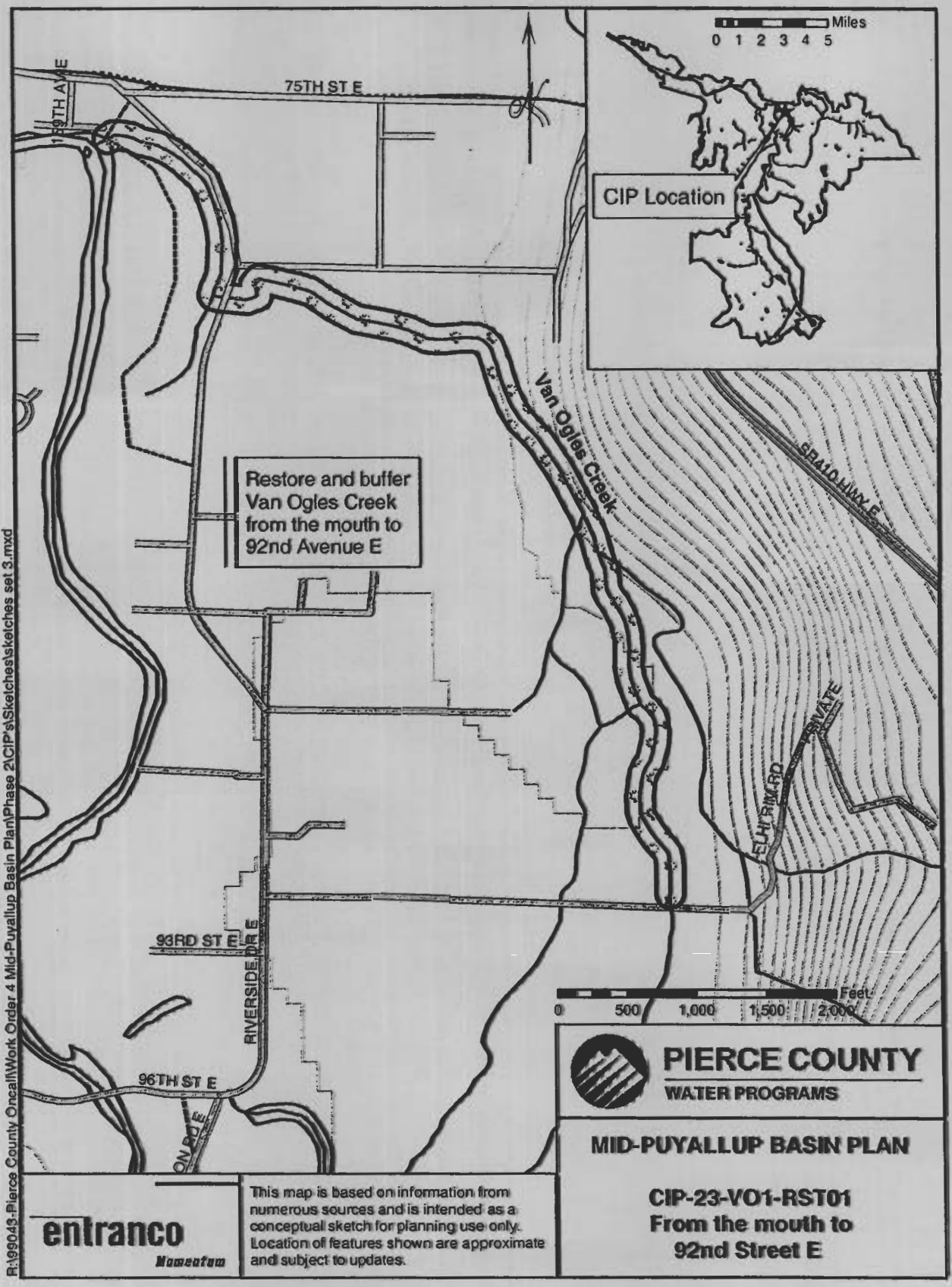
Item	Unit	Unit Cost	Quantity	Cost
Stream Restoration	LF	$ 205	8000	$ 1,640,000
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 1,640,000
			Contingency (20%)	$ 328,000
			Sub-Total	$ 1,968,000
			Engineering and Administration (20%)	$ 393,600
			Total Land Costs	$ -
			*** Project Cost**	$ 2,361,600

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
75TH ST E
119TH AVE
Restore and buffer Van Ogles Creek from the mouth to 92nd Avenue E
Van Ogles Creek
SR 410 HWY E
PRIVATE
ELHI RIM RD
93RD ST E
RIVERSIDE DR E
96TH ST E
ON RD E
Feet
0 500 1,000 1,500 2,000
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-VO1-RST01
From the mouth to
92nd Street E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
R:\99045-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 3.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-V01-C01	Subbasin: Van Ogles Creek - VO1	
Location: Riverside Drive, South of 78th Street East		
Description: Riverside Drive East Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding – solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	7	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)	7	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5		
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5		
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	19	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	13	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)		
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)		
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)		
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	13	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	10	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)		
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	15	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	40	LOW

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)		
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)		
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	3	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	3	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	75	LOW

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Van Ogles Creek Crossing at Riverside Drive E
Project Number: CIP-23-VO1-C01
Project Type: Fish Barrier Replacement
Sub-Basin: VO-1

Existing Conditions: The Van Ogles Creek culvert at Riverside Drive is a partial fish barrier. This culvert is furthest downstream and will effect fish passage for all other culvert on the creek.

Analysis: Field assessments were made to determine the creek width that then determines the necessary culvert width.

Proposed Solution/ Project Description Replace culvert with an 12-foot by 8-foot box culvert, 50 feet long, countersunk to 3 feet and filled with streambed gravel to the natural bed level.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

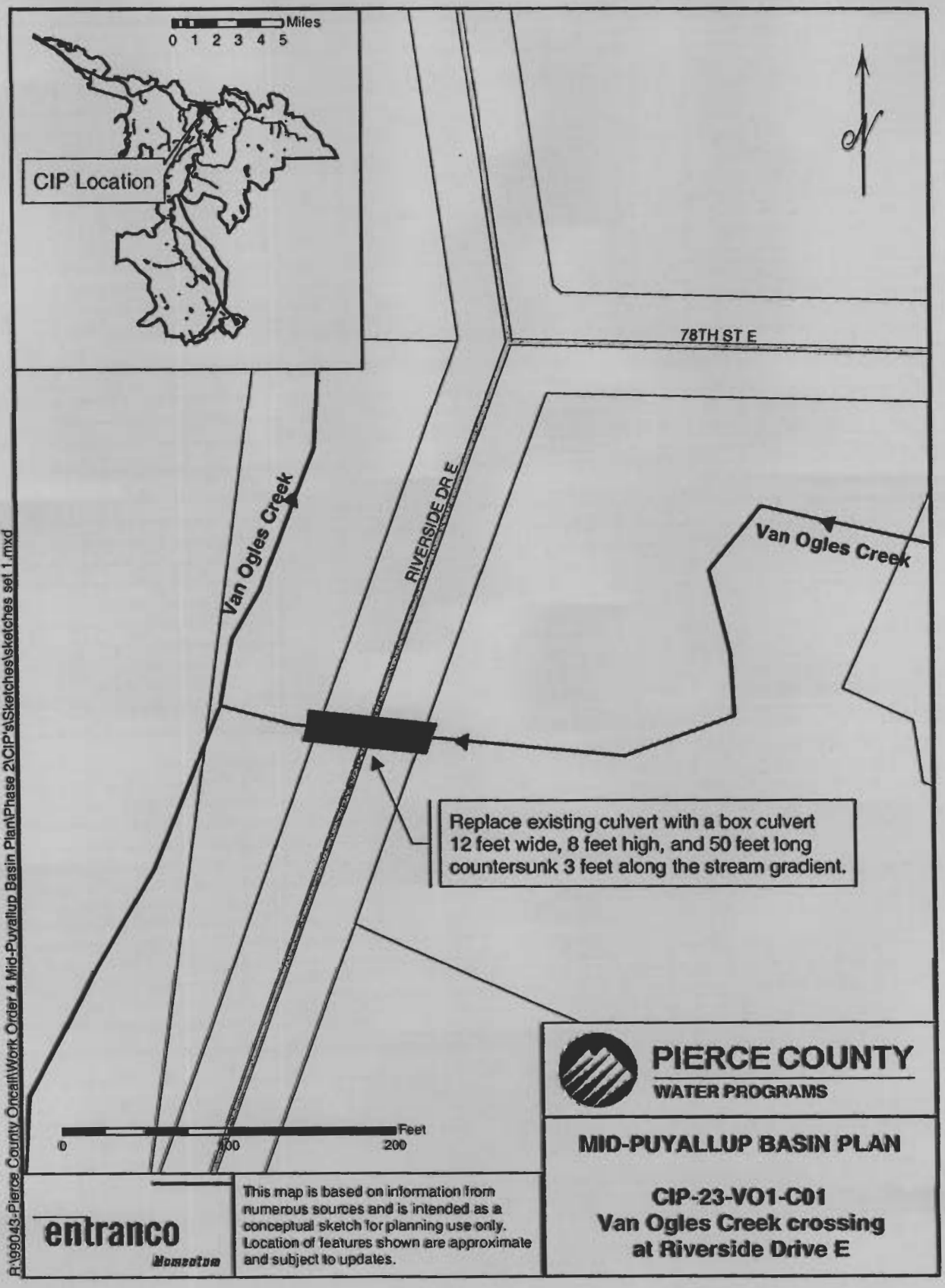
Item	Unit	Unit Cost	Quantity	Cost
12' x 8' Box Culvert	LF	$ 1,560	50	$ 78,000
Streambed Gravel	Ton	$ 33	90	$ 2,970
Stream Restoration	LF	$ 205	50	10,250
				-
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 91,220
			Contingency (20%)	$ 18,244
			Sub-Total	$ 109,464
			Engineering and Administration (35%)	$ 38,312
			Total Land Costs	$ -
			*** Project Cost**	$ 147,776

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
78TH ST E
RIVERSIDE DR E
Van Ogles Creek
Van Ogles Creek
Replace existing culvert with a box culvert
12 feet wide, 8 feet high, and 50 feet long
countersunk 3 feet along the stream gradient.
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-VO1-C01
Van Ogles Creek crossing
at Riverside Drive E
entranco
Bellevue
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-BC2-RST01	Subbasin: Ball Creek - BC2	
Location: At confluence of Ball Creek with Puyallup River		
Description: Mouth of the Ball Creek Fish Passage		

1. FLOOD REDUCTION	SCORE	PRIORIT.
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding – solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)		
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	10	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	23	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)		
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)		
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	10	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	10	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	40	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	30	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)	20	
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	10	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	15	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)	5	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	95	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	10	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	10	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	40	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**198**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Mouth of Ball Creek
Project Type: Fish barrier removal

Project Number: CIP-23-BC2-RST01
Sub-Basin: BC-2

Existing Conditions: The channel at the mouth is filled in with rock that forms a fish barrier.

Analysis: Field assessment.

Proposed Solution/ Project Description: Restore and restructure the mouth of Ball Creek to allow for fish passage. Remove the rocks and boulders and, if property access is available, re-grade the stream to prevent the drop in gradient at the mouth from becoming a nick-point that migrates upstream. If property access is not available, use log weirs to form cascading step pools over a shorter reach length.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

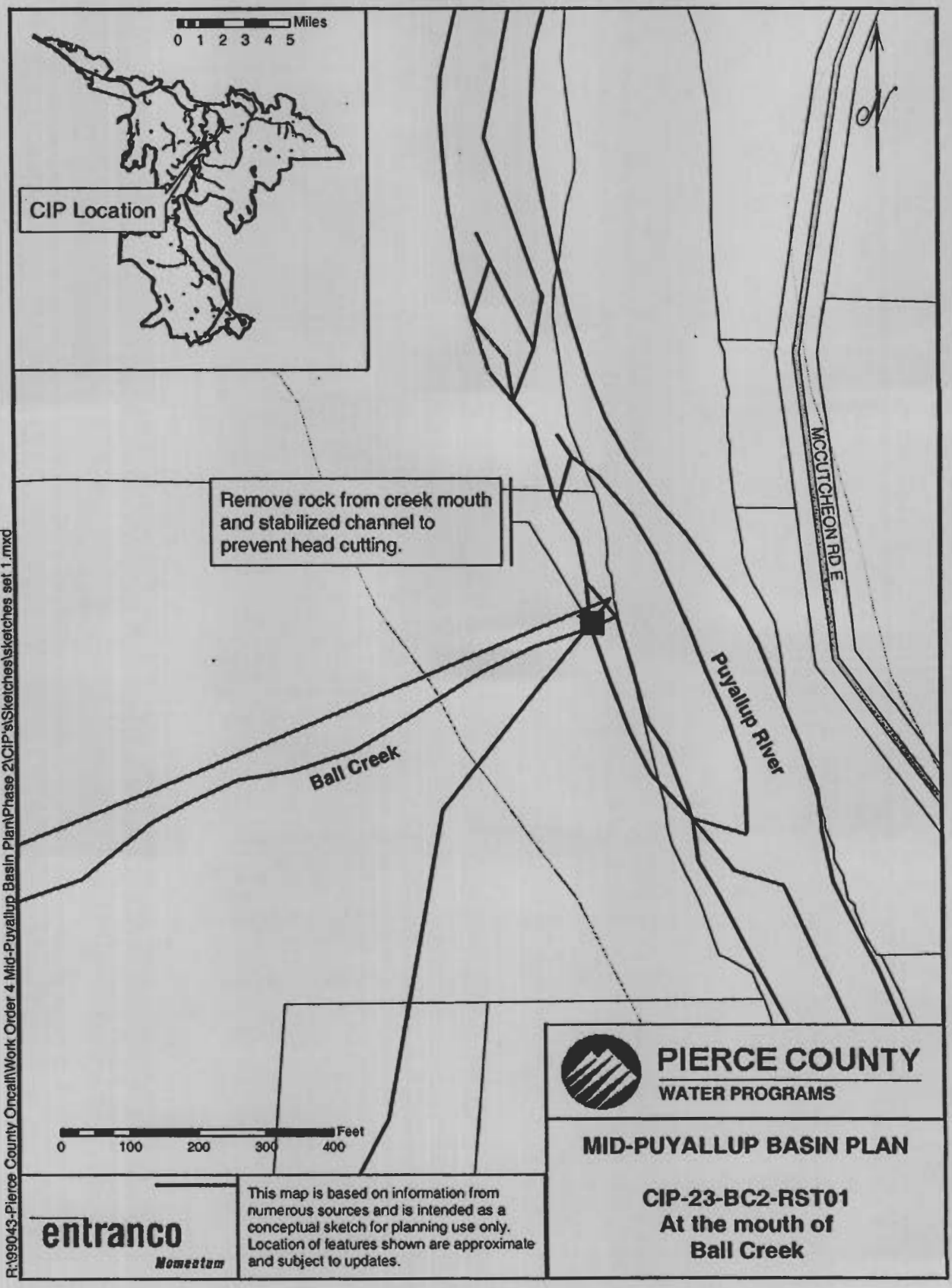
Item	Unit	Unit Cost	Quantity	Cost
Removal of Fish Blockage (Rip Rap)	Ton	$ 15	27	$ 405
Stream Restoration	LF	$ 205	100	$ 20,500
Log Weirs	EA	$ 10,000	6	$ 60,000
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 80,905
			Contingency (20%)	$ 16,181
			Sub-Total	$ 97,086
			Engineering and Administration (35%)	$ 33,980
			Total Land Costs	$ -
			*** Project Cost**	$ 131,066

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
Remove rock from creek mouth and stabilized channel to prevent head cutting.
MCCUTCHEON RD E
Puyallup River
Ball Creek
N
Feet
0 100 200 300 400
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-BC2-RST01
At the mouth of
Ball Creek
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
entranco
Momentum
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd

Project Name: Mouth of Ball Creek
Project Type: Property Acquisition
Project Number: CIP-23-BC2-AC01
Sub-Basin: BC-2

Existing Conditions: A 40-acre parcel of property is for sale that encompasses the mouth of Ball Creek. The property is zoned agricultural.

Analysis: Field assessment.

Proposed Solution/ Project Description Purchase the 40-acre property for restoration and preservation of Ball Creek.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
Parcel	AC	$ 11,000	20	$ 220,000
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 220,000
			Contingency (20%)	$ 44,000
			Total Land Costs	$ 264,000

*** Construction Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Sub-Total	$ -
			Engineering and Administration (35%)	$ -
			Total Land Costs	$ 264,000
			*** Project Cost**	$ 264,000

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.

CIP Prioritization Worksheet

Project ID: CIP-23-BC2-AC01	Subbasin: Ball Creek - BC2	
Location: End of 106th Street East		
Description: Mouth of Ball Creek Property Acquisition		

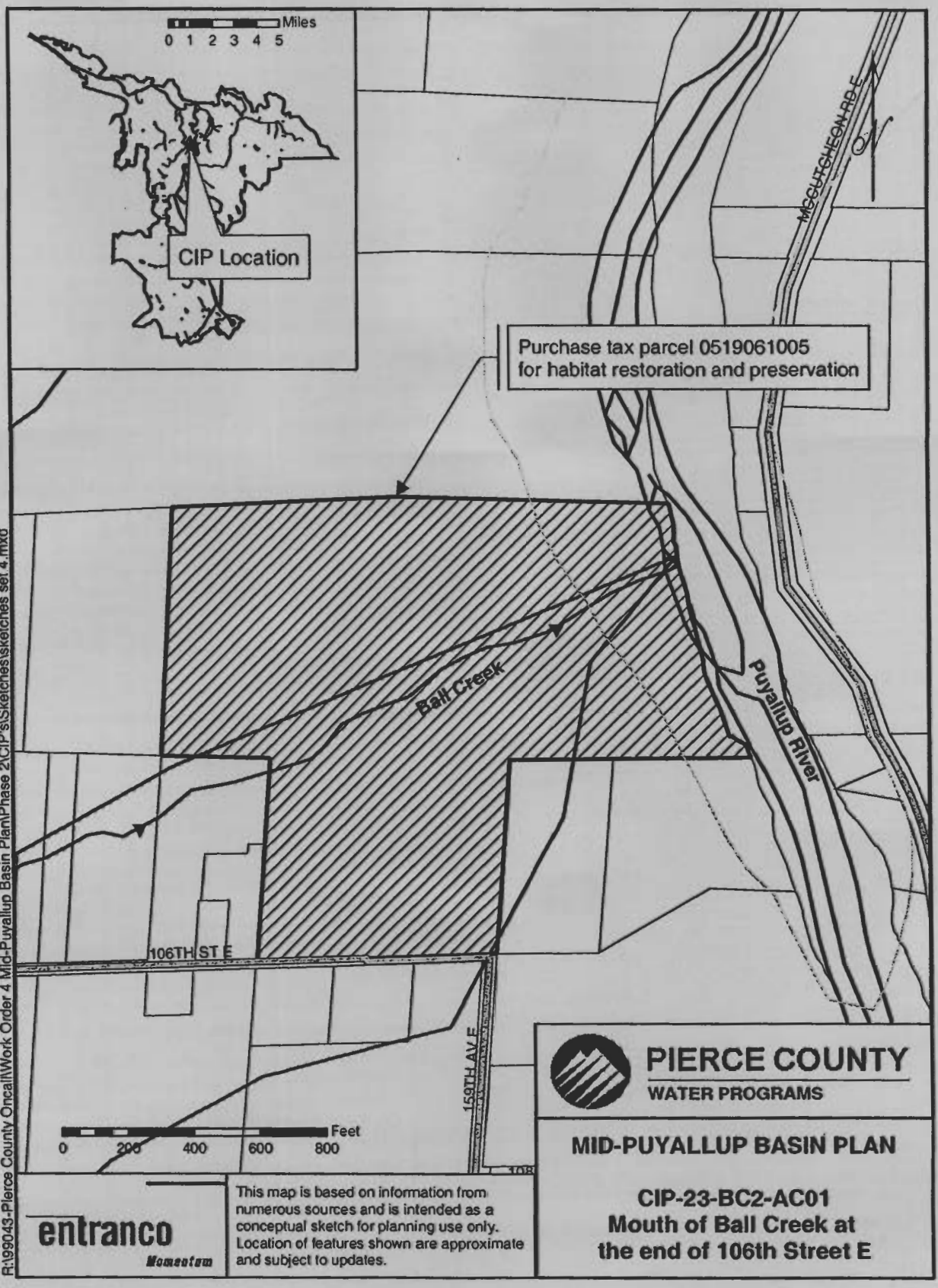
1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding - solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)		
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5		
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5		
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	5	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)		
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)		
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	20	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	30	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	70	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	30	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)	20	
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	7	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	35	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)	5	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	112	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	10	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	10	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	3	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	33	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**220**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.


Miles
0 1 2 3 4 5
CIP Location
Purchase tax parcel 0519061005
for habitat restoration and preservation
McCutcheon Rd E
Ball Creek
Puyallup River
106TH ST E
159TH AV E
Feet
0 200 400 600 800
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 4.mxd
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-BC2-AC01
Mouth of Ball Creek at
the end of 106th Street E

CIP Prioritization Worksheet

Project ID: CIP-23-BC2-RST02	Subbasin: Ball Creek - BC2	
Location: From the mouth of Ball Creek to Old Military Road		
Description: Ball Creek Restoration		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding – solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	7	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)		
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	10	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	30	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	7	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)	13	
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	7	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	30	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	30	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	107	MEDIUM

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	30	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)	20	
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	10	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	15	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)	5	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	95	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	10	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	10	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	40	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**272**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Ball Creek Riparian Restoration
Project Number: CIP-23-BC2-RST02
Project Type: Water Quality and Habitat enhancement
Sub-Basin: BC-2

Existing Conditions: The riparian corridor lacks shade providing vegetation.

Analysis: Field assessment and aerial photography.

Proposed Solution/ Project Description Replant riparian corridor, install fencing to restrict live stock where needed, install structures to stabilize banks.

Design Assumptions: It is assumed that access to the properties containing riparian area will be available.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

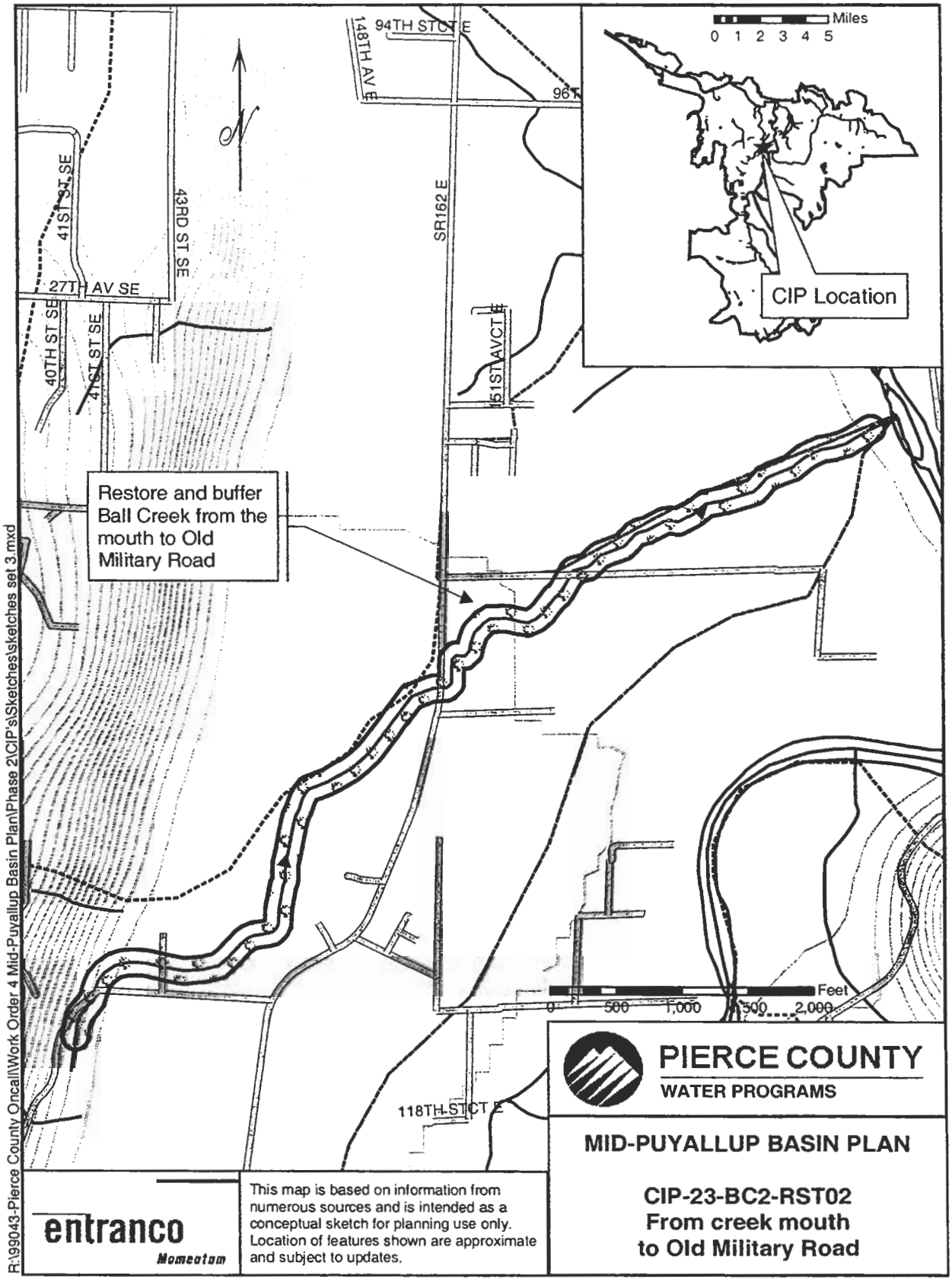
Item	Unit	Unit Cost	Quantity	Cost
Stream Restoration	LF	$ 205	8448	$ 1,731,840
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 1,731,840
			Contingency (20%)	$ 346,368
			Sub-Total	$ 2,078,208
			Engineering and Administration (20%)	$ 415,642
			Total Land Costs	$ -
			*** Project Cost**	**$ 2,493,850**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
94TH ST CT E
148TH AV E
96T
SR162 E
43RD ST SE
41ST ST SE
27TH AV SE
40TH ST SE
41ST ST SE
151ST AVCT E
Restore and buffer Ball Creek from the mouth to Old Military Road
Feet
0 500 1,000 1,500 2,000
118TH ST CT E
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-23-BC2-RST02
From creek mouth
to Old Military Road
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
entranco
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CIP Prioritization Worksheet

Project ID: CIP-23-BC2-C01–C06	Subbasin: Ball Creek - BC 2	
Location: Ball Creek downstream from 106th Street East		
Description: Ball Creek Fish Barrier Culvert Replacements		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	3	
*b. **Frequency of Flooding – solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	15	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	13	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	20	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	10	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	10	
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**76**	**MEDIUM**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	20	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**61**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	20	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	20	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	35	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**90**	**MEDIUM**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	7	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**7**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**234**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Lower Reach of Ball Creek
Project Number: CIP-23-BC2-C01.06
Project Type: Culvert replacements for fish passage
Sub-Basin: BC-2

Existing Conditions: There are six culverts on private property along Ball Creek that flood or are fish barriers or both.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description Replace all six culverts so that they are fish passable.

Design Assumptions: Assumed three existing private property culverts were 20' long and 18" diameter. Replacements for these are estimated at 48 inches based on modeled results from culverts upstream.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

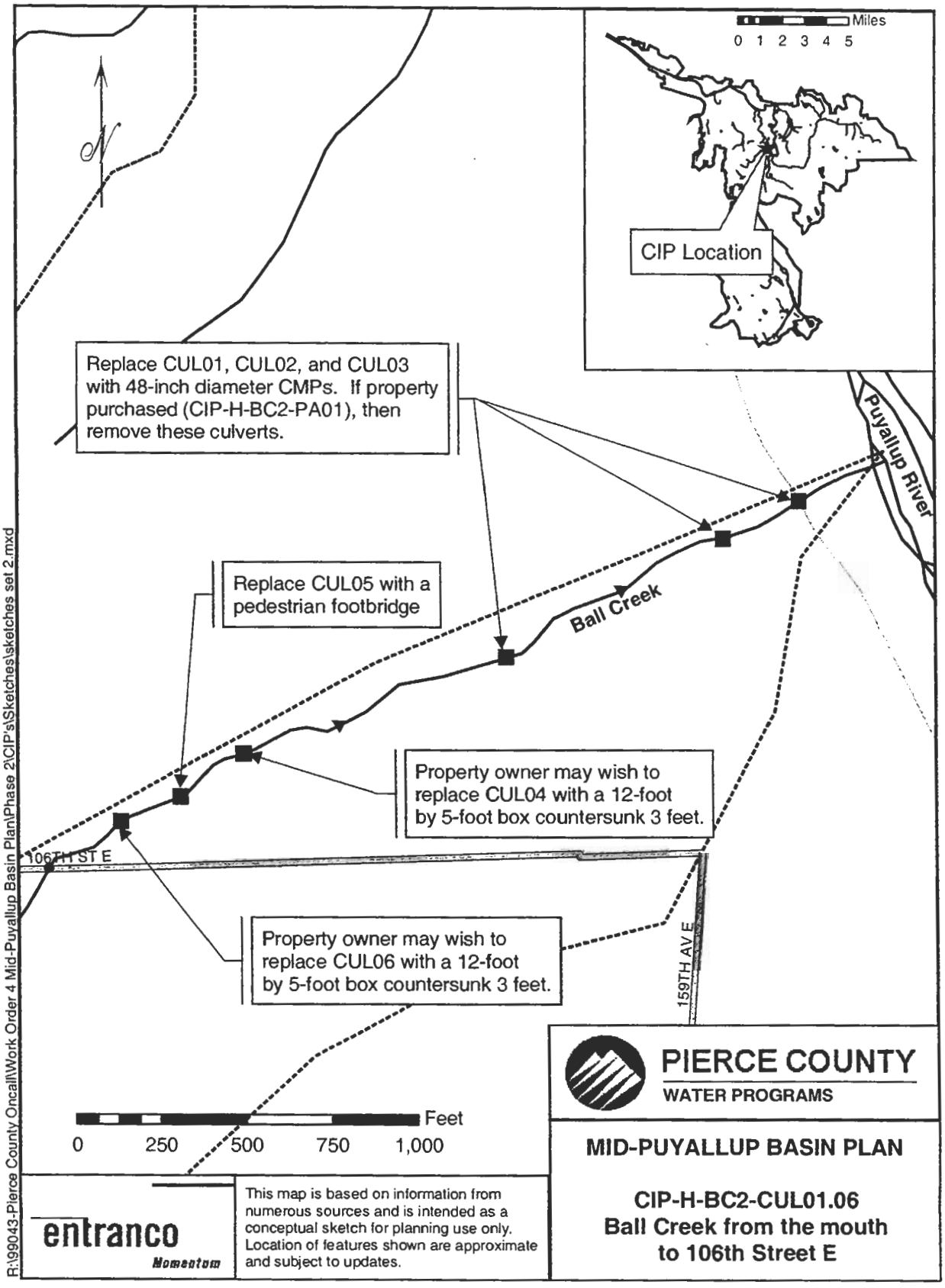
Item	Unit	Unit Cost	Quantity	Cost
48" Diameter Culvert	LF	$ 105	20	$ 2,100
48" Diameter Culvert	LF	$ 105	20	$ 2,100
48" Diameter Culvert	LF	$ 105	20	$ 2,100
Pedestrian Bridge (r051721a)	SF	$ 85	60	$ 5,100
Streambed Gravel	Ton	$ 33	71	$ 2,343
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 23,993
			Contingency (20%)	$ 4,799
			Sub-Total	$ 28,792
			Engineering and Administration (35%)	$ 10,077
			Total Land Costs	$ -
			*** Project Cost**	**$ 38,869**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.



PIERCE COUNTY
WATER PROGRAMS

MID-PUYALLUP BASIN PLAN

CIP-H-BC2-CUL01.06
Ball Creek from the mouth to 106th Street E

entranco
Momentum

This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.

CIP Prioritization Worksheet

Project ID: CIP-23-BC1-C07	Subbasin: Ball Creek - BC1	
Location: 106th Street East, east of SR 162 East		
Description: 106th Street East Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	25	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	15	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	10	
b. Frequency of Flooding – solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)	20	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	15	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	15	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	145	MEDIUM
2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	20	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)	20	
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	20	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	10	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	20	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	110	MEDIUM
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	20	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	7	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	30	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)	5	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	77	MEDIUM
4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)		
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)		
c. Provides public education opportunities (high = 10, medium = 7, low = 3)		
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	0	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	**332**	**HIGH**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: 106th Street E Culvert Replacement
Project Number: CIP-23-BC1-C07
Project Type: Roadway flooding
Sub-Basin: BC-1

Existing Conditions: Water overtops the roadway at the 10-year event; there is also bank erosion upstream of the culvert.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description: Replace culvert with an 12-foot by 5-foot box culvert countersunk 2 feet. Stabilize bank for 100-feet upstream.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

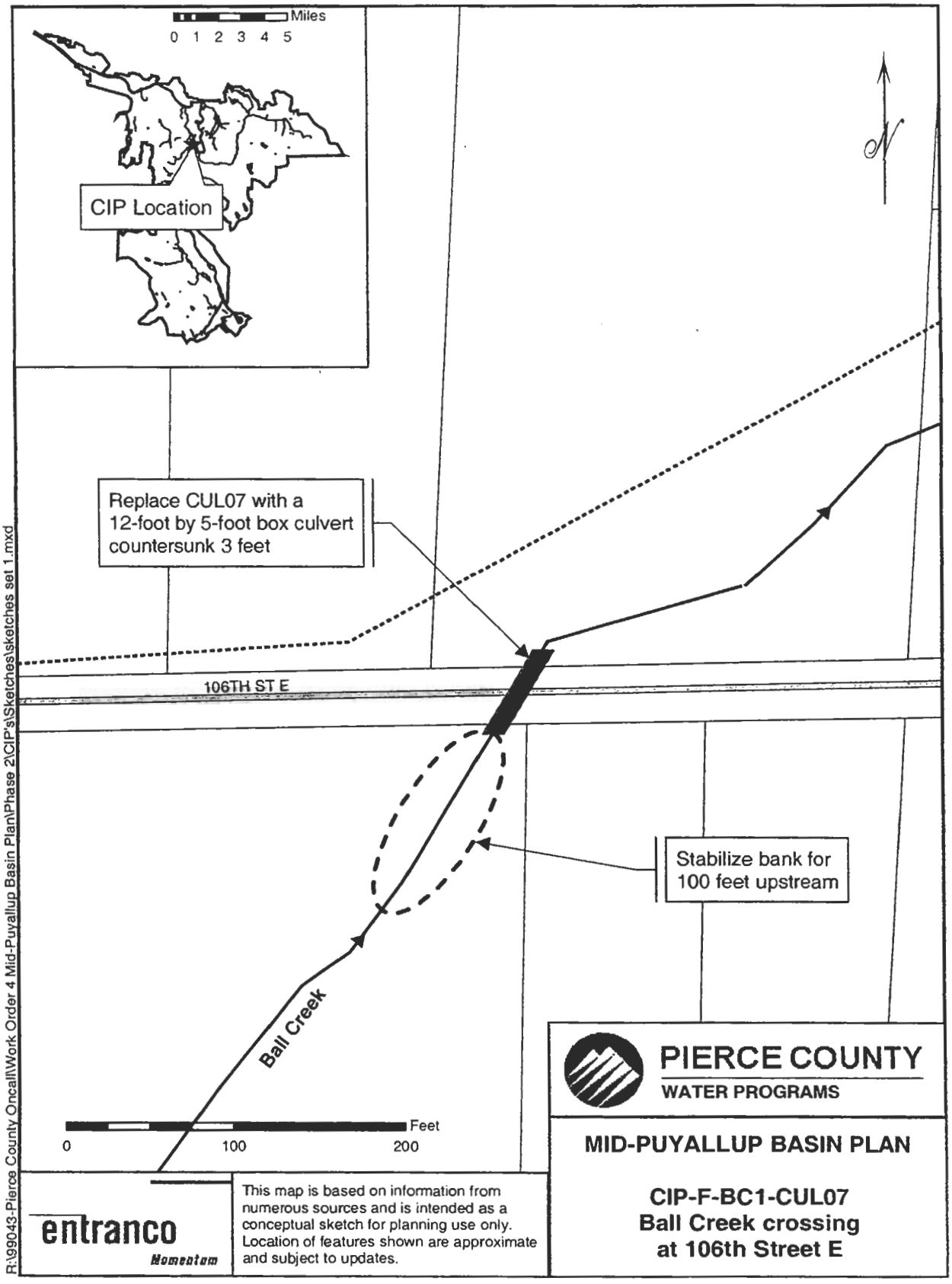
Item	Unit	Unit Cost	Quantity	Cost
5' x 12' Box Culvert (r051216c)	LF	$ 1,245	31	$ 38,595
Streambed Gravel	Ton	$ 33	38	$ 1,254
Stream Stabilization	LF	$ 205	125	$ 25,625
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 65,474
			Contingency (20%)	$ 13,095
			Sub-Total	$ 78,569
			Engineering and Administration (35%)	$ 27,499
			Total Land Costs	$ -
			*** Project Cost**	**$ 106,068**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
Replace CUL07 with a
12-foot by 5-foot box culvert
countersunk 3 feet
106TH ST E
Stabilize bank for
100 feet upstream
Ball Creek
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-BC1-CUL07
Ball Creek crossing
at 106th Street E
entranco
Momentum
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R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-BC1-CO8	Subbasin: Ball Creek BC1	
Location: Pioneer Way North of 109th Street East		
Description: Pioneer Way Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	3	
*b. **Frequency of Flooding - solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	20	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	20	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	5	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*		
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**53**	**LOW**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*		
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**46**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	10	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*		
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	10	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**40**	**LOW**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	3	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**3**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**142**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Ball Creek Crossing at Pioneer Way
Project Number: CIP-23-BC1-C08
Project Type: Fish Barrier Replacement
Sub-Basin: BC-1

Existing Conditions: The Ball Creek crossing at Pioneer Way is a fish barrier.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description Replace the culvert with a 12-foot by 5-foot box culvert, 60 feet long, that is counter sunk 2 feet along the stream gradient.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

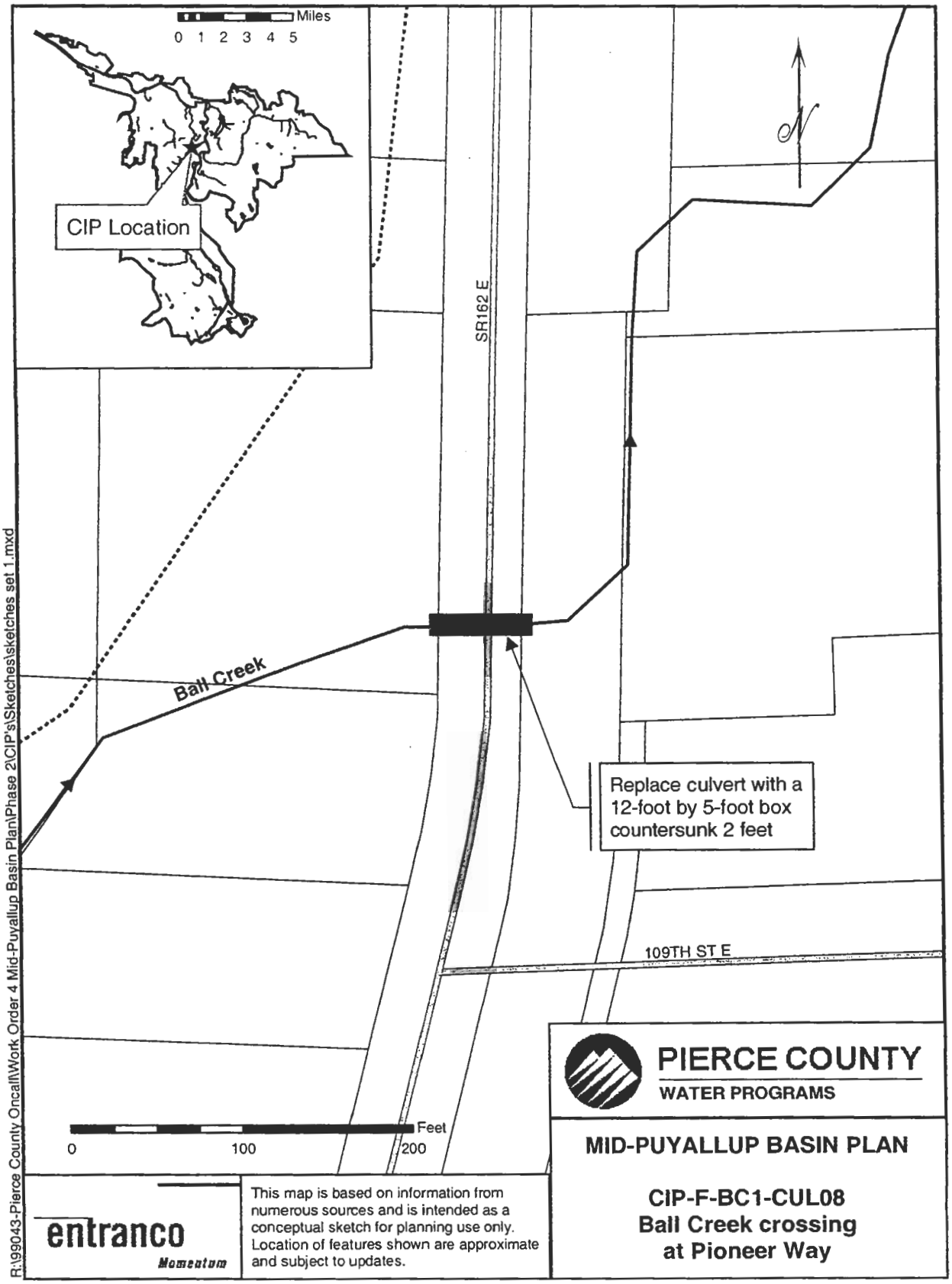
Item	Unit	Unit Cost	Quantity	Cost
5' x 12' Box Culvert	LF	$ 1,245	60	$ 74,700
Streambed Gravel	Ton	$ 33	73	$ 2,409
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 87,359
			Contingency (20%)	$ 17,472
			Sub-Total	$ 104,831
			Engineering and Administration (35%)	$ 36,691
			Total Land Costs	$ -
			*** Project Cost**	**$ 141,522**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
SR162 E
Ball Creek
Replace culvert with a 12-foot by 5-foot box countersunk 2 feet
109TH ST E
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-BC1-CUL08
Ball Creek crossing
at Pioneer Way
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-BC1-CO9	Subbasin: Ball Creek - BC1	
Location: Access Road and Railroad North of Military Road		
Description: Railroad Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	3	
*b. **Frequency of Flooding - solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	10	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	13	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	7	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	5	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	5	
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	48	LOW

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*		
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	41	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	10	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*		
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	10	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	40	LOW

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	3	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	3	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	**132**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Ball Creek Crossing at Railroad Access Road
Project Number: CIP-23-BC1-C09
Project Type: Fish Barrier Replacement
Sub-Basin: BC-1

Existing Conditions: The Ball Creek culvert at the railroad and access road crossing is a fish barrier.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description: Replace culvert with an 12-foot by 5-foot box culvert, 38 feet long, countersunk 2 feet and filled with streambed gravel to the natural bed level.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

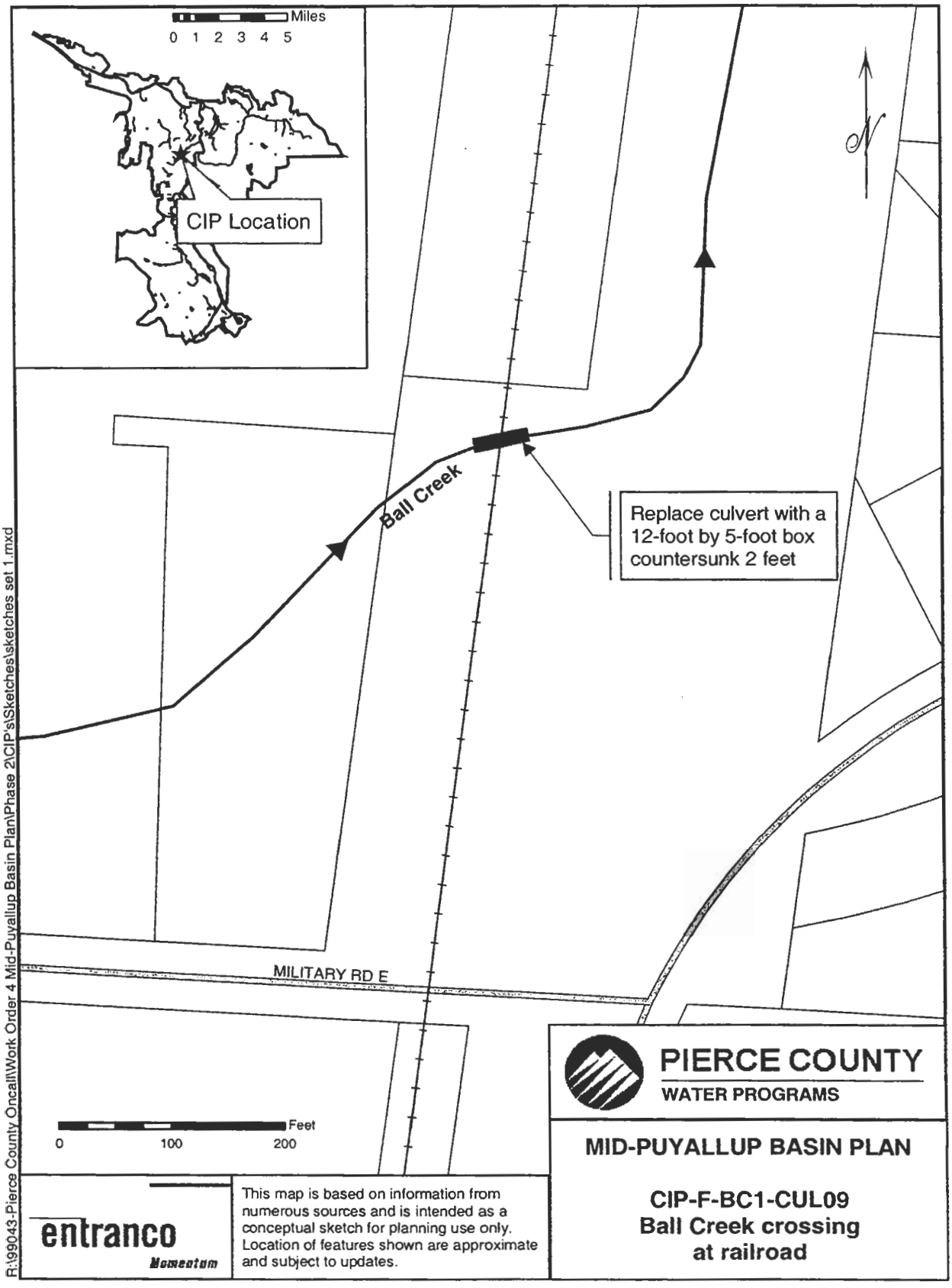
Item	Unit	Unit Cost	Quantity	Cost
5' x 12' Box Culvert	LF	$ 1,245	38	$ 47,310
Streambed Gravel	Ton	$ 33	46	$ 1,518
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 59,078
			Contingency (20%)	$ 11,816
			Sub-Total	$ 70,894
			Engineering and Administration (35%)	$ 24,813
			Total Land Costs	$ -
			*** Project Cost**	**$ 95,706**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
Ball Creek
Replace culvert with a 12-foot by 5-foot box countersunk 2 feet
MILITARY RD E
Feet
0 100 200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-BC1-CUL09
Ball Creek crossing at railroad
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-BC1-C11	Subbasin: Ball Creek - BC1	
Location: Military Road, West of SR 162		
Description: Military Road Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	3	
*b. **Frequency of Flooding – solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	13	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	7	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	5	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	5	
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	38	LOW

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*		
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	41	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	10	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*		
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	8	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	38	LOW

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	3	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	3	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	**120**	LOW

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Ball Creek Crossing at Old Military Road E
Project Number: CIP-23-BC1-C11
Project Type: Fish Barrier Replacement
Sub-Basin: BC-1

Existing Conditions: The Ball Creek culvert at Old Military Road E is a fish barrier.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description Replace the culvert with a 10 foot diameter, 63 feet long, CMP arch culvert.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

Item	Unit	Unit Cost	Quantity	Cost
120" Diameter Culvert	LF	$ 230	63	$ 14,490
Streambed Gravel	Ton	$ 33	77	$ 2,541
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 27,281
			Contingency (20%)	$ 5,456
			Sub-Total	$ 32,737
			Engineering and Administration (35%)	$ 11,458
			Total Land Costs	$ -
			*** Project Cost**	**$ 44,195**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.

CIP Prioritization Worksheet

Project ID: CIP-23-FCI-BRG01	Subbasin: Fennel Creek - FC1
Location: McCutcheon Road at Fennel Creek Crossing	
Description: McCutcheon Road Bridge Replacement	

1. FLOOD REDUCTION	SCORE
a. Level of Flooding *(score all that apply)*	
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	10
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	7
b. Frequency of Flooding – solves an existing problem *(select & score one)*	
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	10
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*	
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*	20
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*	20
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - *High = 15, Medium = 10, Low = 5*	15
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - *High = 15, Medium = 10, Low = 5*	5
h. Provides basin-wide flood reduction benefit *(For programmatic recommendations only)*	
i. Provides county-wide flood reduction benefit *(For programmatic recommendations only)*	
TOTAL FLOODING SCORE (Maximum Score of 185)	**92**

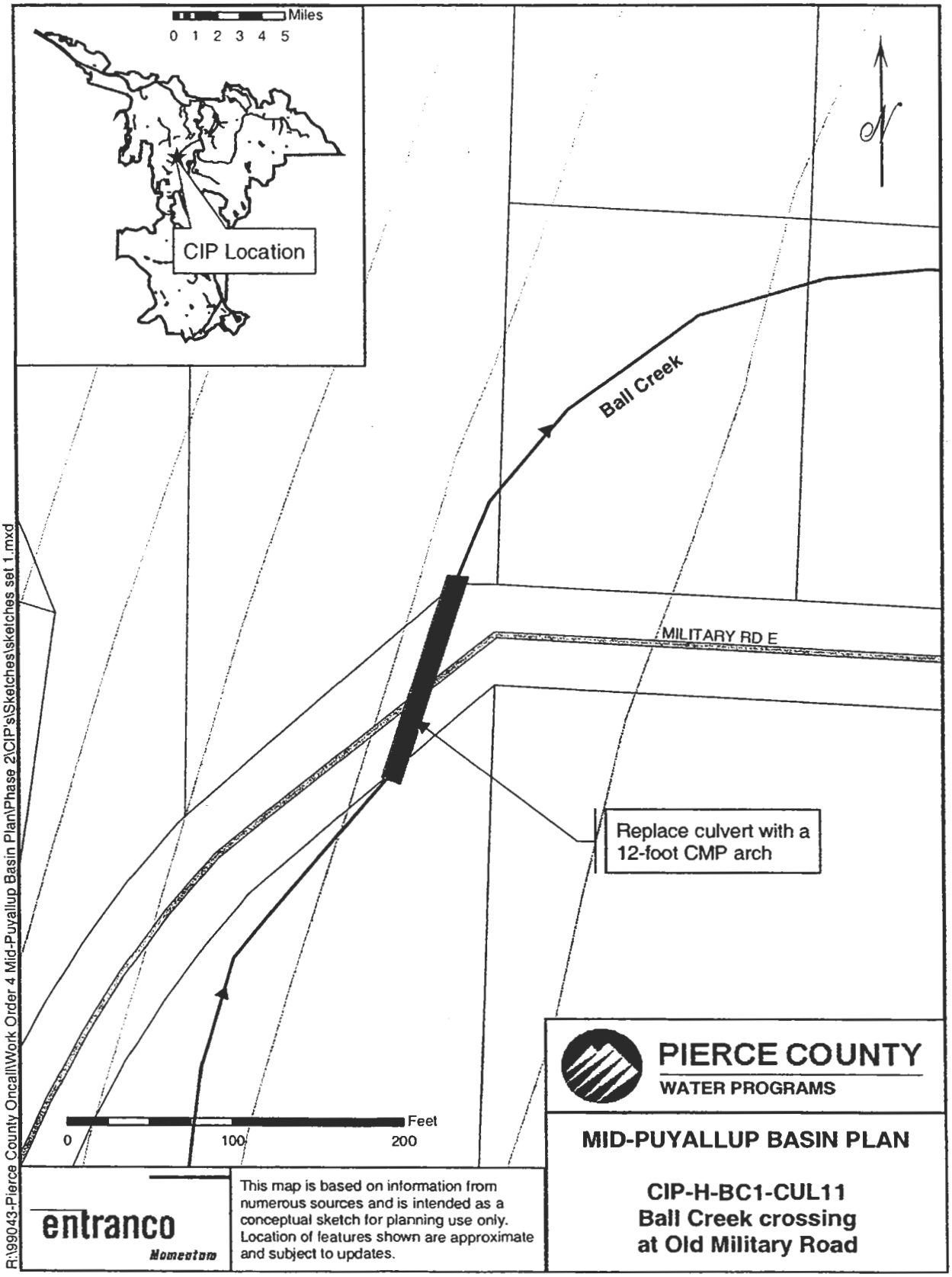
2. WATER QUALITY IMPROVEMENT	
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*	20
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*	20
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*	7
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*	13
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*	20
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*	
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*	
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*	
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*	
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*	
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**80**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION	
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*	
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*	
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*	
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*	10
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*	5
f Increases extent of salmonid spawning habitat *(Q = [Good(ft) + Fair(ft)] / [Total (ft)])*	
Opens passage to long reach of habitat (>4000 ft) Q*80	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65	
Opens passage to short reach of habitat (<1000 ft) Q*50	
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*	
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*	
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*	
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**15**

4. OTHER FACTORS	
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*	
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*	
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*	
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*	10
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**10**

TOTAL PROJECT SCORE (Maximum Score 545)	**197**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.


Miles
0 1 2 3 4 5
CIP Location
N
Ball Creek
MILITARY RD E
Replace culvert with a
12-foot CMP arch
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-H-BC1-CUL11
Ball Creek crossing
at Old Military Road
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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Project Name: Flooding of McCutcheon Road by Fennel Creek
Project Number: CIP-23-FC1-BRG01
Project Type: Bridge replacement and road raising
Sub-Basin: FC-1

Existing Conditions: The McCutcheon Road bridge crossing at Fennel Creek floods during the 10-year event. This road runs along the slope break between the steep valley wall and the flat valley bottom. Sediment moving down the channel accumulates at this slope break and further reduces the capacity of the bridge.

Analysis: A HEC-RAS computer model developed for FEMA mapping was used to determine the frequency of road flooding at this site.

Proposed Solution/ Project Description Raise the road surface elevation 2 feet to provide the height needed to raise the low cord of the bridge 2 feet. Install additional culverts under the roadway on either side of the bridge to achieve capacity required for high flows. Either a series of six circular, 30-inch, CMPs or two 2-foot by 10 foot box culverts can be installed adjacent to the bridge depending on available space.

Design Assumptions: Existing bridge is not salvageable. Fill from raising the roadway can be contained in the ROW.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

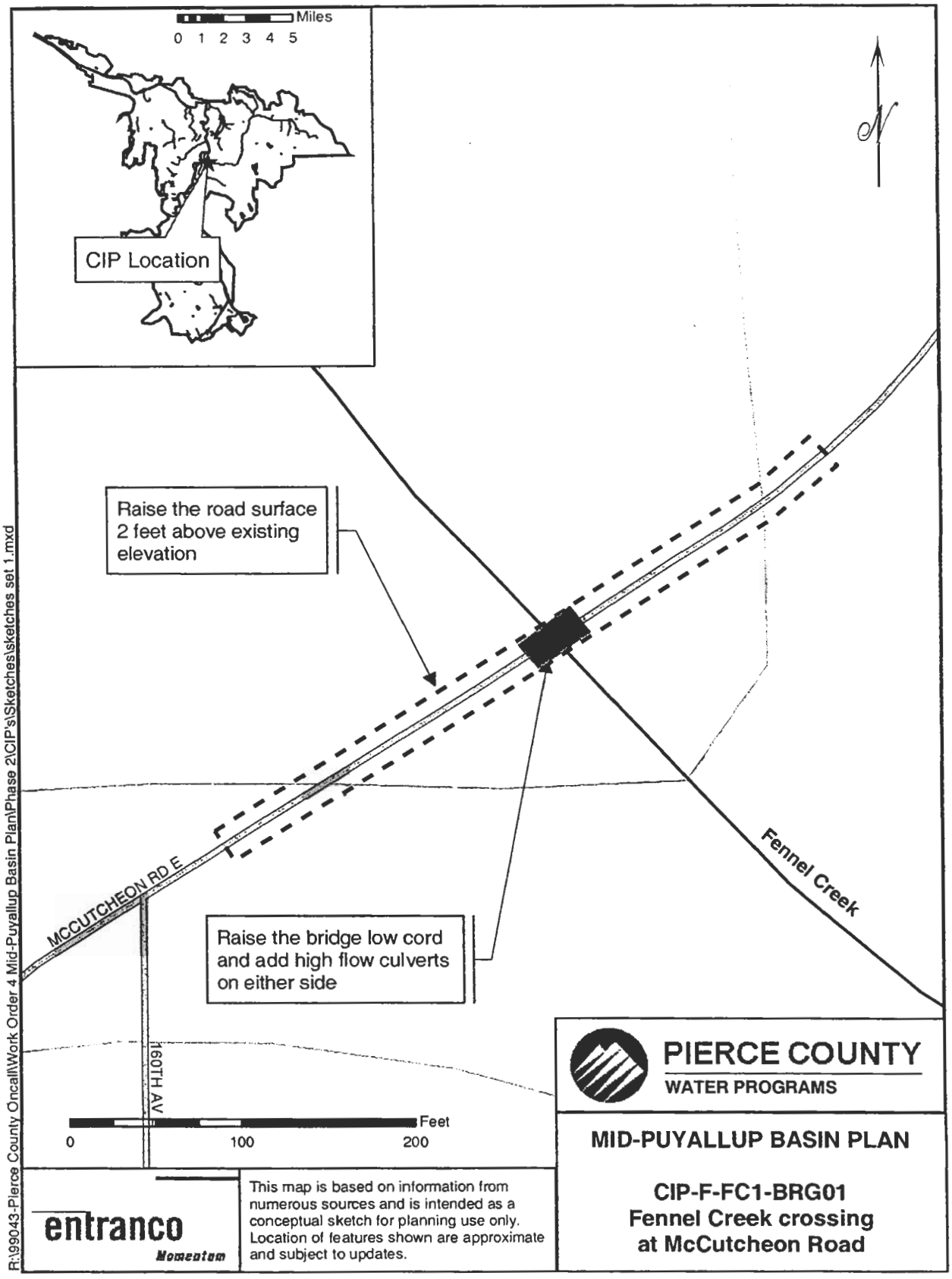
Item	Unit	Unit Cost	Quantity	Cost
Gravel Borrow Incl. Haul	Ton	$ 11	1924	$ 21,164
Removing Asphalt Concrete Pavement	SY	$ 6	1900	$ 11,400
Roadway Excavation Incl. Haul	Ton	$ 11	350	$ 3,850
Crushed Surfacing Base Course	Ton	$ 20	642	$ 12,840
Asphalt Conc. Pavement CL. A	Ton	$ 55	642	$ 35,310
Asphalt Conc. Pavement CL. E	Ton	$ 45	642	$ 28,890
Replacement Bridge	SF	$ 100	900	$ 90,000
30" Culvert	LF	$ 90	180	$ 16,200
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
			Total	$ 229,904
			Contingency (20%)	$ 45,981
			Sub-Total	$ 275,885
			Engineering and Administration (25%)	$ 68,971
			Total Land Costs	$ -
			*** Project Cost**	**$ 344,856**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
Raise the road surface 2 feet above existing elevation
Raise the bridge low cord and add high flow culverts on either side
MCCUTCHEON RD E
160TH AV
Fennel Creek
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-FC1-BRG01
Fennel Creek crossing
at McCutcheon Road
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-FC3-BRG02	Subbasin: Fennel Creek - FC3	
Location: Kelly Lake Road at Fennel Creek Crossing		
Description: Kelly Lake Road Bridge Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	10	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	7	
*b. **Frequency of Flooding - solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	7	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	7	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*		
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*		
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**36**	**LOW**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	13	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*		
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**34**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*		
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*		
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	7	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	3	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*		
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**10**	**LOW**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*		
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**0**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**80**	**LOW**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Fennel Creek Crossing at Kelly Lake Road
Project Number: CIP-23-FC3-BRG02
Project Type: Bridge Replacement and road raising
Sub-Basin: FC-3

Existing Conditions: Water overtops Kelly Lake Road at the 10-year event.

Analysis: Hydrologic and Hydraulic models were developed and used to assess flooding conditions along Ball Creek and to size replacement culverts. Field assessments were also made, where possible, to verify model results.

Proposed Solution/ Project Description Raise the road surface two feet and set one of the bridge abutments back eight feet from its current location to expand the bridge opening. This will provide sufficient capacity under the bridge for passing a 100-year event.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

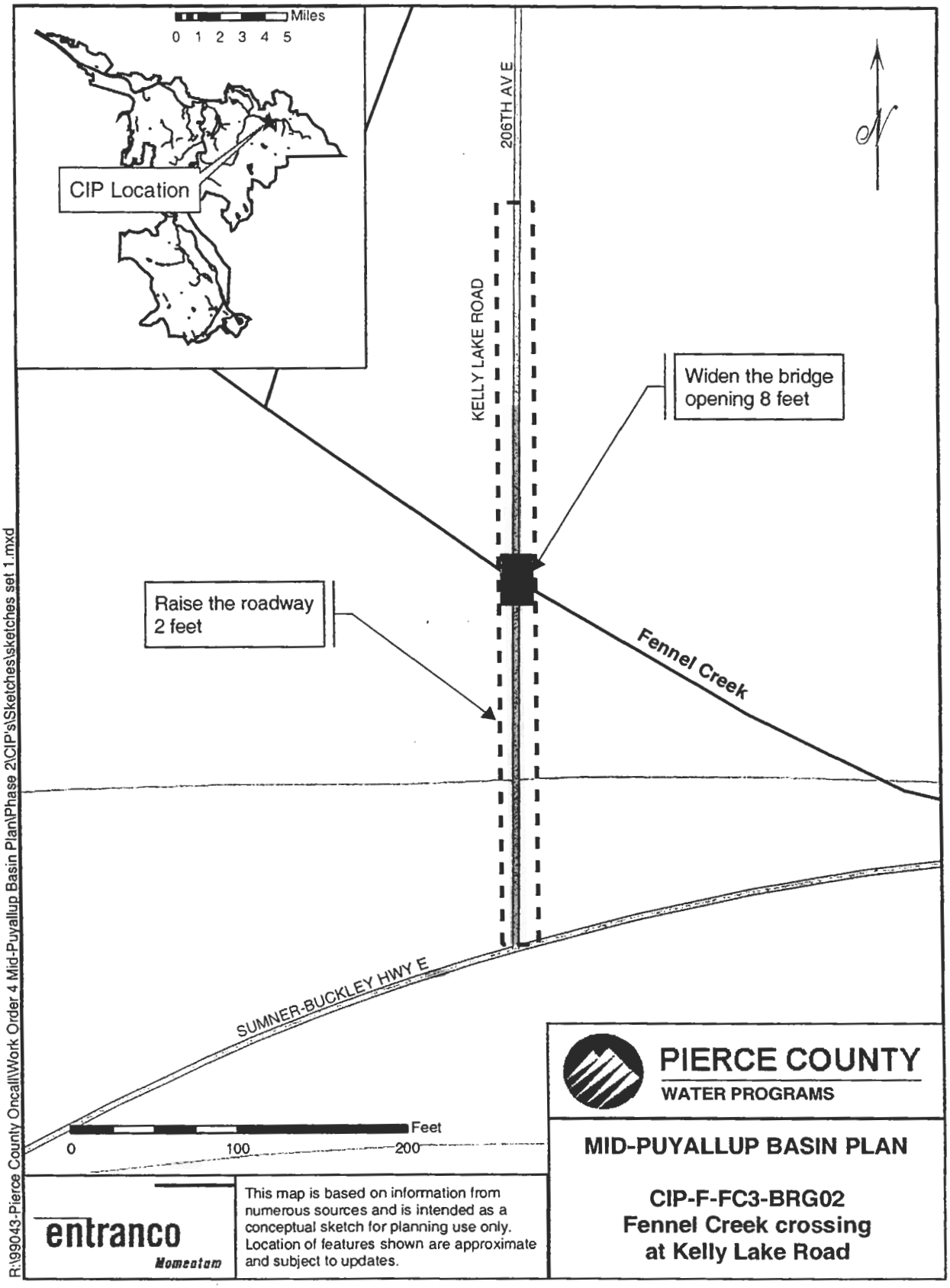
Item	Unit	Unit Cost	Quantity	Cost
Gravel Borrow Incl. Haul	Ton	$ 11	2166	$ 23,826
Removing Asphalt Concrete Paveme	SY	$ 6	2667	$ 16,002
Roadway Excavation Incl. Haul	Ton	$ 11	1708	$ 18,788
Crushed Surfacing Base Course	Ton	$ 20	912	$ 18,240
Asphalt Conc. Pavement CL. A	Ton	$ 55	456	$ 25,080
Asphalt Conc. Pavement CL. E	Ton	$ 45	456	$ 20,520
Replacement Bridge	SF	$ 100	600	$ 60,000
Stream Restoratoin	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 192,706
			Contingency (20%)	$ 38,541
			Sub-Total	$ 231,247
			Engineering and Administration (25%)	$ 57,812
			Total Land Costs	$ -
			*** Project Cost**	**$ 289,059**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
206TH AV E
KELLY LAKE ROAD
Widen the bridge opening 8 feet
Raise the roadway 2 feet
Fennel Creek
SUMNER-BUCKLEY HWY E
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-FC3-BRG02
Fennel Creek crossing
at Kelly Lake Road
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
entranco
Momentum
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CIP Prioritization Worksheet

Project ID: CIP-23-FC1-RST01	Subbasin: Fennel Creek - FC1	
Location: Fennel Creek Restoration from SR 410 to Kelly Lake Road		
Description: Fennel Creek Restoration		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
*b. **Frequency of Flooding - solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	7	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*		
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*		
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*		
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	10	
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**20**	**LOW**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	20	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	7	
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	10	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	30	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	30	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**124**	**MEDIUM**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	30	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	20	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	10	
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	30	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**110**	**MEDIUM**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	10	
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	10	
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**40**	**HIGH**
TOTAL PROJECT SCORE (Maximum Score 545)	**294**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Fennel Creek Riparian Restoration
Project Number: CIP-23-FC1-RST01
Project Type: Water Quality and Habitat enhancement
Sub-Basin: FC-1

Existing Conditions: The riparian corridor lacks shade providing vegetation.

Analysis: Field assessment and aerial photography.

Proposed Solution/ Project Description Replant riparian corridor, install fencing to restrict live stock where needed, install structures to stabilize banks.

Design Assumptions: It is assumed that access to the properties containing riparian area will be available.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

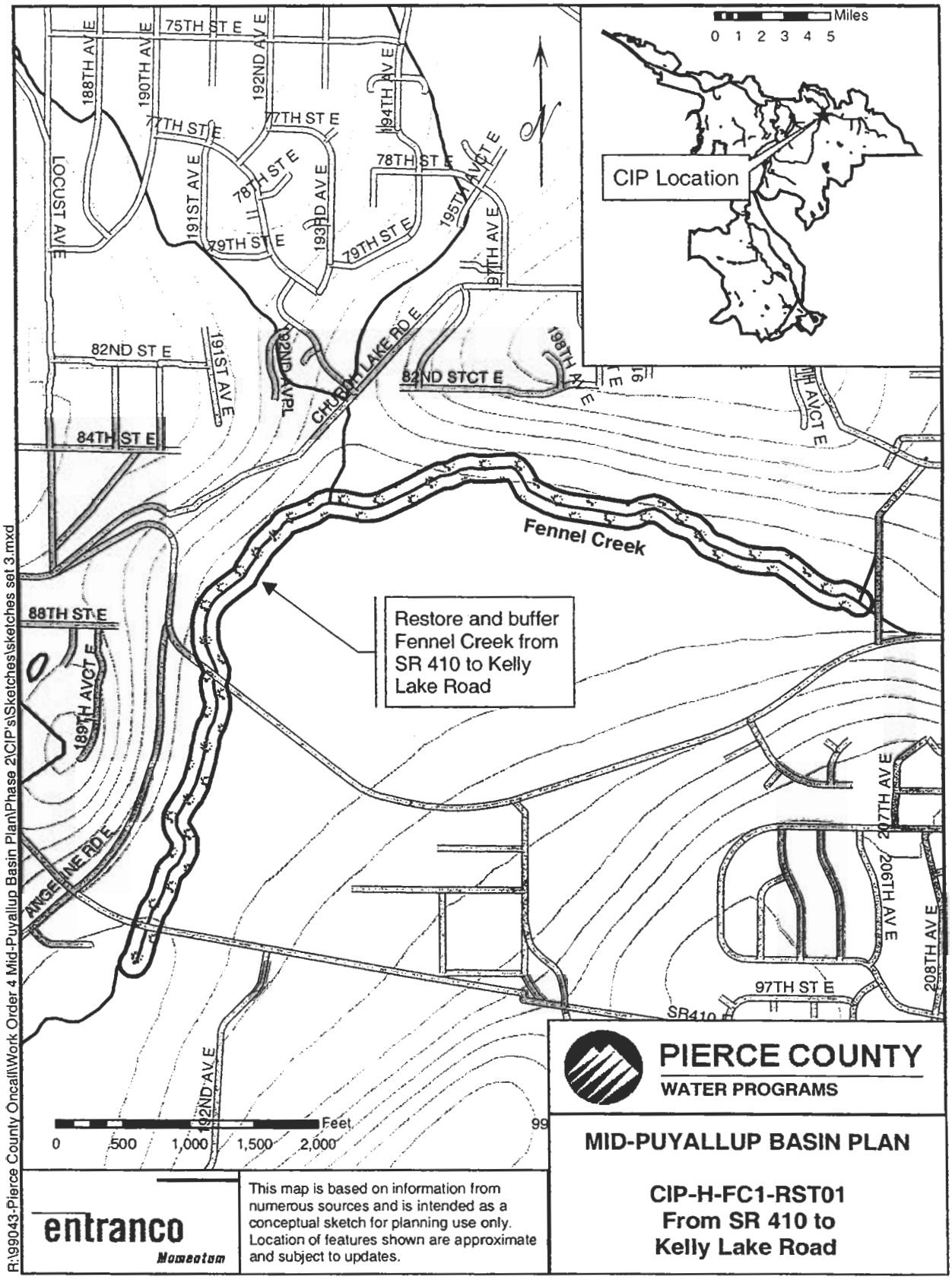
Item	Unit	Unit Cost	Quantity	Cost
Stream Restoration	LF	$ 205	8448	$ 1,731,840
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 1,731,840
			Contingency (20%)	$ 346,368
			Sub-Total	$ 2,078,208
			Engineering and Administration (20%)	$ 415,642
			Total Land Costs	$ -
			*** Project Cost**	**$ 2,493,850**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
Restore and buffer Fennel Creek from SR 410 to Kelly Lake Road
Fennel Creek
75TH ST E
77TH ST E
78TH ST E
79TH ST E
82ND ST E
82ND STCT E
84TH ST E
88TH ST E
97TH ST E
SR410
188TH AV E
190TH AV E
192ND AV E
194TH AV E
191ST AV E
193RD AV E
195TH AVCT E
197TH AV E
198TH AV E
189TH AVCT E
207TH AV E
206TH AV E
208TH AV E
LOCUST AV E
191ST AV E
192ND AVPL
CHURCH LAKE RD E
ANGELINE RD E
Feet
0 500 1,000 1,500 2,000
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-H-FC1-RST01
From SR 410 to
Kelly Lake Road
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
entranco
Momentum
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CIP Prioritization Worksheet

Project ID: CIP-23-FC5-DP01	Subbasin: Fennel Creek - FC5	
Location: 108th Street Court East and 206th Avenue Court East		
Description: Fir Ridge Infiltration Pond		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	25	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	20	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	15	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	10	
b. Frequency of Flooding - solves an existing problem		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	15	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	10	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	5	
c. Required due to flooding liability (high = 20, medium = 13, low = 7)	20	
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)	20	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	15	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	15	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	215	HIGH

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)		
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	13	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)	13	
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	13	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)		
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	39	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)		
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)		
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)		
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)		
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	0	LOW

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)		
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	10	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)		
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	20	MEDIUM
TOTAL PROJECT SCORE (Maximum Score 545)	**274**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Fir Ridge Pond Overtopping
Project Number: CIP-23-FC5-DP01
Project Type: Detention Pond Improvement
Sub-Basin: FC-5

Existing Conditions: The stormwater pond serving the Fir Ridge development (formerly Wembley Park) is an infiltration facility with a history of overtopping. The pond was enlarged in the early 1990s but overtopped again during the major flood in winter of 1996–97. The pond sits at a low point with no defined or constructed outlet for flow.

Analysis: The Hydrologic Engineering Center – Hydrologic Modeling System (HEC-HMS, version 2.2.1) computer model was used to evaluate the potential for routing overflow to Ponderosa Pond.

Proposed Solution/ Project Description Route overflow from Fir Ridge Pond to Ponderosa Pond. An estimated 99,910 cubic feet of water at a peak discharge of 4.72 cfs would be directed to Ponderosa Pond during a 100-year 24-hour event. An 18-inch pipe set 1-foot below the berm elevation of the Fir Ridge Pond is needed for this conveyance. To avoid increasing the surface water elevation of Ponderosa Pond, the outlet control structures need to be modified, the flow path that conveys water to the infiltration pond needs to be expanded, and the infiltration pond itself needs to be enlarged to receive this additional volume.

Design Assumptions: It is assumed that there is addaquate space for the existing retention pond at the end of the outlet routing to be expanded.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
Medium Residental	Acre	$ 65,000	1	$ 65,000
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 65,000
			Contingency (20%)	$ 13,000
			Total Land Costs	**$ 78,000**

*** Construction Costs**

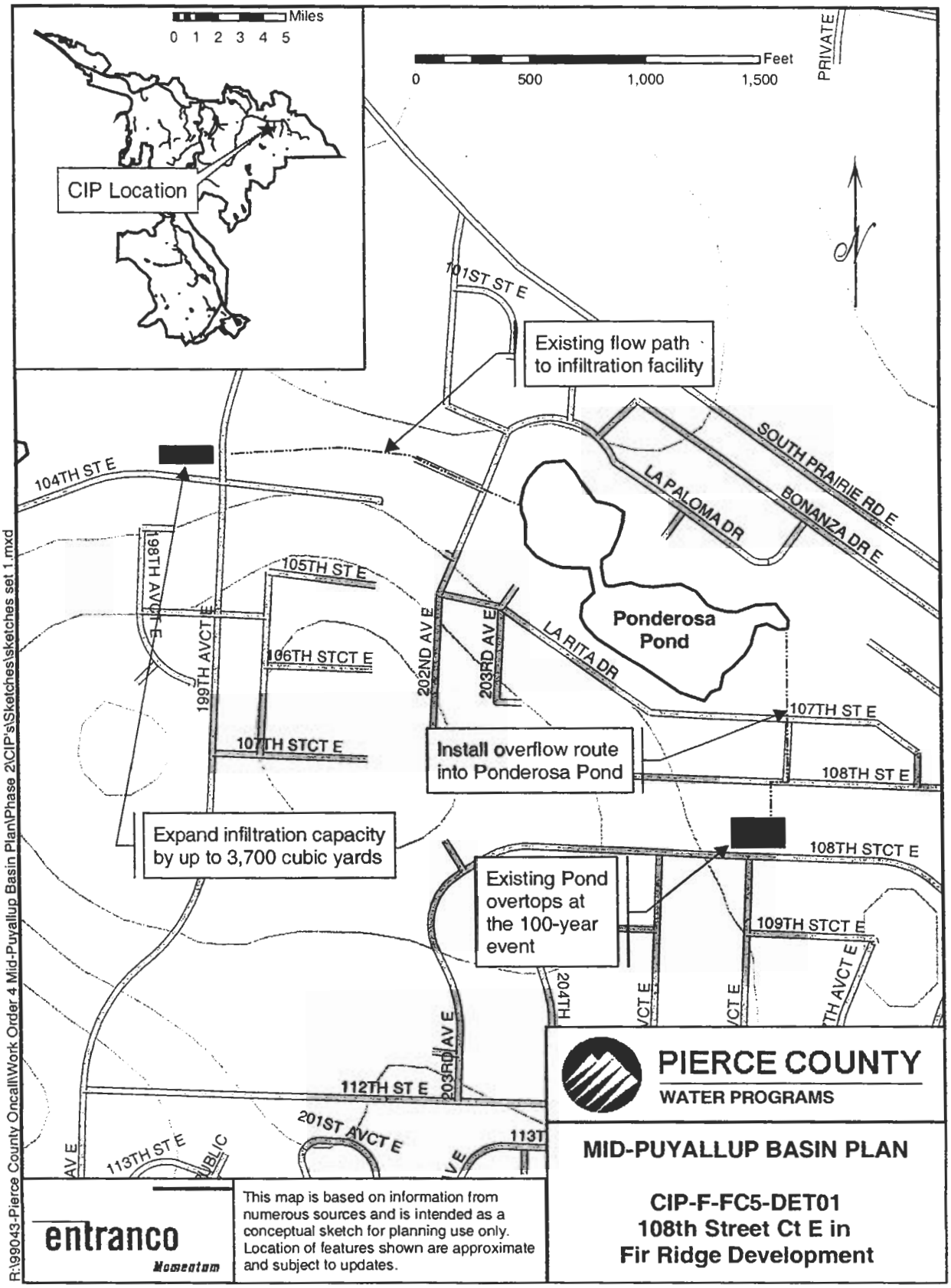
Item	Unit	Unit Cost	Quantity	Cost
18" Diameter Storm Pipeline	LF	$ 70	960	$ 67,200
36" Riser	LF	$ 90	4	$ 360
Infiltration Pond Improvements	CF	$ 0.10	99910	$ 9,991
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 77,551
			Contingency (20%)	$ 15,510
			Sub-Total	$ 93,061
			Engineering and Administration (**%)	$ 33,621
			Total Land Costs	$ 78,000
			*** Project Cost**	**$ 204,682**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio: #DIV/0!
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
Feet
0 500 1,000 1,500
PRIVATE
101ST ST E
Existing flow path to infiltration facility
SOUTH PRAIRIE RD E
LA PALOMA DR
BONANZA DR E
104TH ST E
198TH AVCT E
105TH ST E
199TH AVCT E
106TH STCT E
202ND AV E
203RD AV E
LA RITA DR
Ponderosa Pond
107TH ST E
107TH STCT E
Install overflow route into Ponderosa Pond
108TH ST E
Expand infiltration capacity by up to 3,700 cubic yards
108TH STCT E
Existing Pond overtops at the 100-year event
109TH STCT E
204TH
203RD AV E
112TH ST E
201ST AVCT E
113TH ST E
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-FC5-DET01
108th Street Ct E in
Fir Ridge Development
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-CFC1-C01	Subbasin: Canyon Fall Creek - CFC1	
Location: McCutcheon Road and Canyon Fall Creek Crossing		
Description: McCutcheon Road Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	3	
b. Frequency of Flooding – solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)	13	
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	13	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)	7	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5		
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	51	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	13	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	7	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	7	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)		
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	27	LOW

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	10	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)		
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	7	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	20	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	42	LOW

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)		
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)		
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	3	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	3	LOW
TOTAL PROJECT SCORE (Maximum Score 545)	**123**	LOW

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Canyon Falls Creek Crossing at McCutcheon Road
Project Number: CIP-23-CFC1-C01
Project Type: Culvert replacement for fish passage
Sub-Basin: CFC-1

Existing Conditions: The 3-foot precast concrete pipe that carries Canyon Falls Creek under McCutcheon Road is submerged on either end with a slope of 1.3 percent and creates a partial blockage to fish due to high velocities.

Analysis: Information from the Pierce County Conservation District Culvert Inventory along with field evaluations were applied to the WDFW stream simulation method for fish passable culver design.

Proposed Solution/ Project Description Replace the culvert with an 12-foot by 5-foot box culvert countersunk along the stream gradient.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

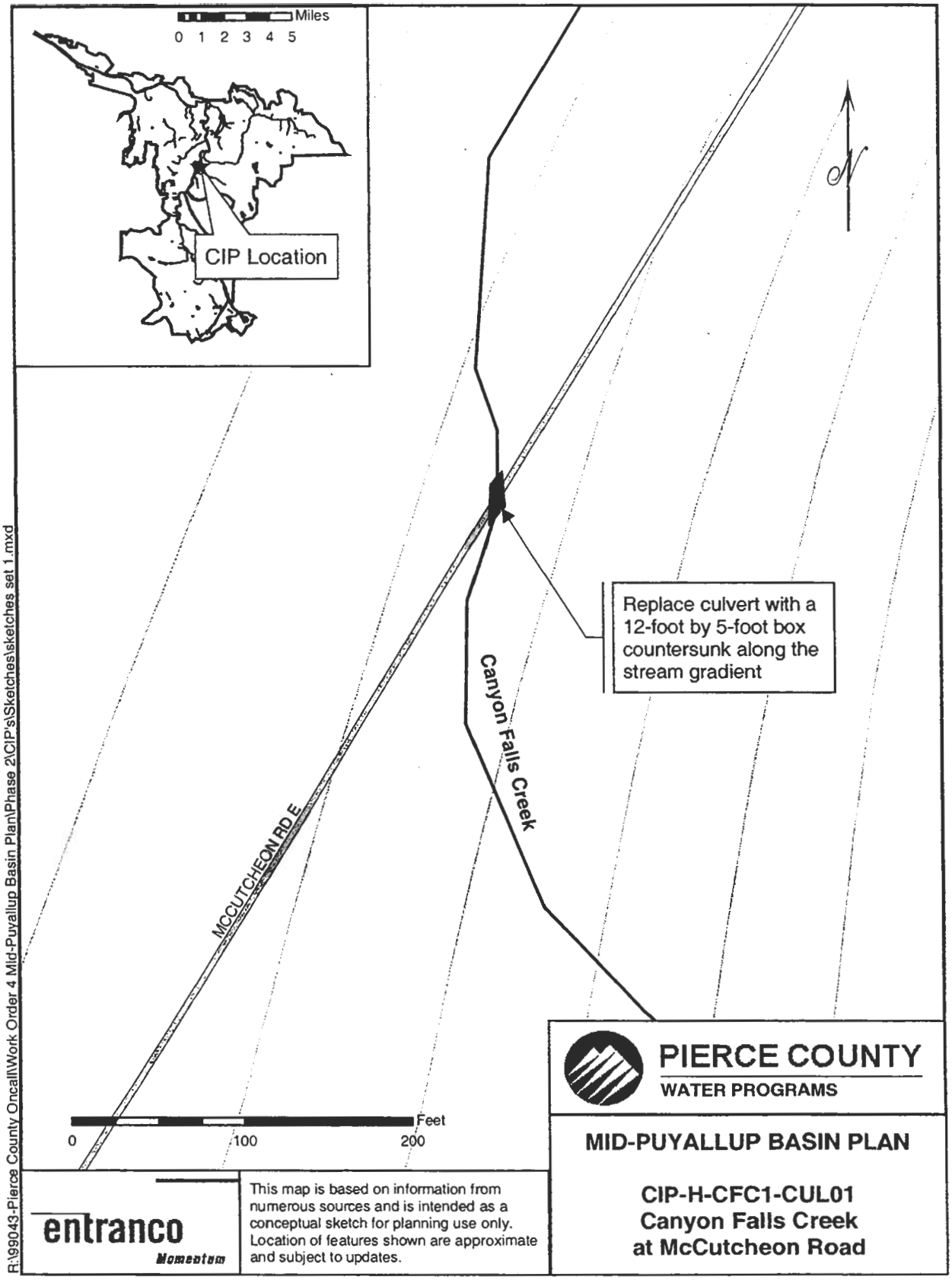
Item	Unit	Unit Cost	Quantity	Cost
5' x 12' Box Culvert	LF	$ 1,245	64	$ 79,680
Streambed Gravel	Ton	$ 33	78	$ 2,574
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 92,504
			Contingency (20%)	$ 18,501
			Sub-Total	$ 111,005
			Engineering and Administration (35%)	$ 38,852
			Total Land Costs	$ -
			*** Project Cost**	**$ 149,856**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.



PIERCE COUNTY
WATER PROGRAMS

MID-PUYALLUP BASIN PLAN

CIP-H-CFC1-CUL01
Canyon Falls Creek
at McCutcheon Road

entranco
Momentum

This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.

R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-HH1-AC01	Subbasin: Horsehaven Creek - HH1	
Location: 168th Street East to the Mouth of Horsehaven Creek		
Description: Mouth of Horsehaven Creek Property Acquisition		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding - solves an existing problem (select & score one)		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability (high = 20, medium = 13, low = 7)		
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	15	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	15	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	75	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)		
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)		
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	20	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	30	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	20	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	90	MEDIUM

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	30	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)	20	
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	7	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f. Increases extent of salmonid spawning habitat (Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80	30	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	102	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)	10	
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	10	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	3	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	33	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**300**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Mouth of Horsehaven Creek
Project Number: CIP-23-HH1-AC01
Project Type: Property Acquisition
Sub-Basin: HH-1

Existing Conditions: The lower reaches of Horsehaven Creek has relatively good habitat with an intact forested riparian corridor. The only degradation at this location is from fine sediment that has built up in the channel bed in response to land use practices up stream.

Analysis: Aerial photos and field visits were used to determine the conservation value of this property.

Proposed Solution/ Project Description Purchase the stream corridor including buffers and adjacent wetlands from 168th Street E to the mouth.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
Parcel	AC	$ 11,000	20	$ 220,000
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 220,000
			Contingency (20%)	$ 44,000
			Total Land Costs	**$ 264,000**

*** Construction Costs**

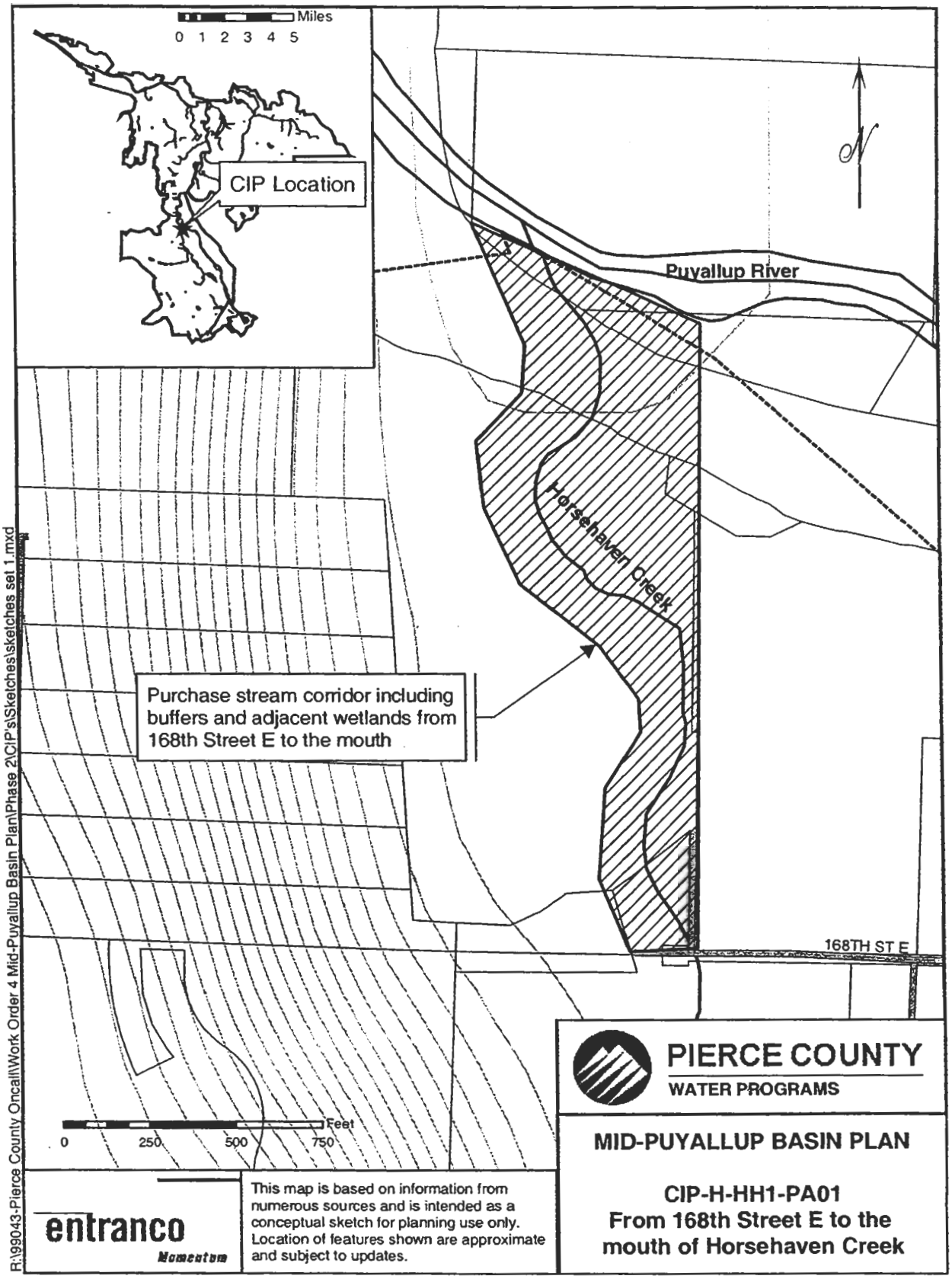
Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Sub-Total	$ -
			Engineering and Administration (35%)	$ -
			Total Land Costs	$ 264,000
			*** Project Cost**	**$ 264,000**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.



PIERCE COUNTY
WATER PROGRAMS

MID-PUYALLUP BASIN PLAN

CIP-H-HH1-PA01
From 168th Street E to the mouth of Horsehaven Creek

entranco
Momentum

This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.

CIP Prioritization Worksheet

Project ID: CIP-23-HH1-AC02	Subbasin: Horsehaven Creek - HH1
Location: South of 168th Street East	
Description: Horsehaven Creek Property Purchase, South of 168th St. E.	

1. FLOOD REDUCTION	SCORE
a. *Level of Flooding (score all that apply)*	
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	
b. ***Frequency of Flooding – solves an existing problem*** *(select & score one)*	
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	
c. ***Required due to flooding liability*** *(high = 20, medium = 13, low = 7)*	
d. ***Increases capacity of flood plain*** *(high = 20, medium = 13, low = 7)*	20
e. ***Corrects non-compliance with County design standard (H/D ratio < 1.5)*** *(high = 20, medium = 13, low = 7)*	
f. ***Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area*** - *High = 15, Medium = 10, Low = 5*	15
g. ***Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later*** - *High = 15, Medium = 10, Low = 5*	15
h. ***Provides basin-wide flood reduction benefit*** *(For programmatic recommendations only)*	
i. ***Provides county-wide flood reduction benefit*** *(For programmatic recommendations only)*	
TOTAL FLOODING SCORE (Maximum Score of 185)	75

2. WATER QUALITY IMPROVEMENT	
a. ***Reduces sources of or impacts from emission of fine sediments*** *(high = 20, medium = 13, low = 7)*	20
b. ***Reduces sources of or impacts from emission of heavy metals*** *(high = 20, medium = 13, low = 7)*	
c. ***Reduces sources of or impacts from emission of excess nutrients*** *(high = 20, medium = 13, low = 7)*	
d. ***Reduces sources of or impacts from excess oxygen demanding conditions*** *(high = 20, medium = 13, low = 7)*	
e. ***Reduces sources of or impacts from emission of oil and grease*** *(high = 20, medium = 13, low = 7)*	20
f. ***Reduces sources of emission of pathogens such as fecal coliform*** *(high = 30, medium = 20, low = 10)*	30
g. ***Lowers water temperature, provides more shade*** *(high = 30, medium = 20, low = 10)*	20
h. ***Provides basin-wide water quality benefits*** *(For programmatic recommendations only)*	
i. ***Provides county-wide water quality benefits*** *(For programmatic recommendations only)*	
j. ***Solves or substantially reduces an existing problem*** *(For programmatic recommendations only)*	
TOTAL WATER QUALITY SCORE (Maximum Score 160)	90

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION	
a. ***Improves and/or protects habitat for aquatic species*** *(high = 30, medium = 20, low = 10)*	30
b. ***Improves and/or protects habitat for terrestrial species*** *(high = 20, medium = 13, low = 7)*	20
c. ***Increases proportion of native plant species*** *(high = 10, medium = 7, low = 3)*	7
d. ***Improves flow regime and/or natural hydrology*** *(high = 10, medium = 7, low = 3)*	7
e. ***Increases channel stability/reduces erosion*** *(high = 5, medium = 3, low = 1)*	5
f ***Increases extent of salmonid spawning habitat*** *(Q = [Good(ft) + Fair(ft)] / [Total (ft)])*	
Opens passage to long reach of habitat (>4000 ft) Q*80	30
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65	
Opens passage to short reach of habitat (<1000 ft) Q*50	
g. ***Salmonids other than cutthroat trout present*** *(high = 5, medium = 3, low = 1)*	
h. ***Provides basin-wide water quality benefits*** *(For programmatic recommendations only)*	
i. ***Provides county-wide water quality benefits*** *(For programmatic recommendations only)*	
j. ***Solves or substantially reduces an existing problem*** *(For programmatic recommendations only)*	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	99

4. OTHER FACTORS	
a. ***Provides recreational or multiple use opportunities*** *(high = 10, medium = 7, low = 3)*	10
b. ***Enhances visual aesthetic of area*** *(high = 10, medium = 7, low = 3)*	10
c. ***Provides public education opportunities*** *(high = 10, medium = 7, low = 3)*	10
d. ***Is a highly visible project or has been on the CIP needs list multiple years.*** *(high = 10, medium = 7, low = 3)*	3
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	33

TOTAL PROJECT SCORE (Maximum Score 545)	**297**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Mouth of Horsehaven Creek
Project Number: CIP-23-HH1-AC02
Project Type: Property Acquisition
Sub-Basin: HH-1

Existing Conditions: The lower reaches of Horsehaven Creek has relatively good habitat with an intact forested riparian corridor. The only degradation at this location is from fine sediment that has built up in the channel bed in response to land use practices up stream.

Analysis: Aerial photos and field visits were used to determine the conservation value of this property.

Proposed Solution/ Project Description Purchase the stream corridor including buffers and adjacent wetlands from 168th Street E to the mouth.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
Parcel	AC	$ 11,000	6	$ 66,000
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 66,000
			Contingency (20%)	$ 13,200
			Total Land Costs	**$ 79,200**

*** Construction Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Sub-Total	$ -
			Engineering and Administration (35%)	$ -
			Total Land Costs	$ 79,200
			*** Project Cost**	**$ 79,200**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.

CIP Prioritization Worksheet

Project ID: CIP-23-HH1-RST01	Subbasin: Horsehaven - HH1	
Location: From Mouth of Horsehaven Creek to 162nd Avenue East		
Description: Horsehaven Creek Restoration		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)		
b. Frequency of Flooding - solves an existing problem *(select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	7	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*		
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*		
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - *High = 15, Medium = 10, Low = 5*	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - *High = 15, Medium = 10, Low = 5*	10	
h. Provides basin-wide flood reduction benefit *(For programmatic recommendations only)*		
i. Provides county-wide flood reduction benefit *(For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	30	LOW

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*	20	
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*	7	
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*	13	
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*	7	
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*	7	
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*	30	
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*	30	
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	114	MEDIUM

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*	30	
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*	20	
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*	10	
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*	10	
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*	5	
f Increases extent of salmonid spawning habitat *(Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	25	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*	5	
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	105	MEDIUM

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*	10	
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*	10	
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	40	HIGH
TOTAL PROJECT SCORE (Maximum Score 545)	**289**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Horsehaven Creek Riparian Restoration
Project Number: CIP-23-HH1-RST01
Project Type: Water Quality and Habitat enhancement
Sub-Basin: HH-1

Existing Conditions: The riparian corridor lacks shade providing vegetation.

Analysis: Field assessment and aerial photography.

Proposed Solution/ Project Description Replant riparian corridor, install fencing to restrict live stock where needed, install structures to stabilize banks.

Design Assumptions: It is assumed that access to the properties containing riparian area will be available.

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

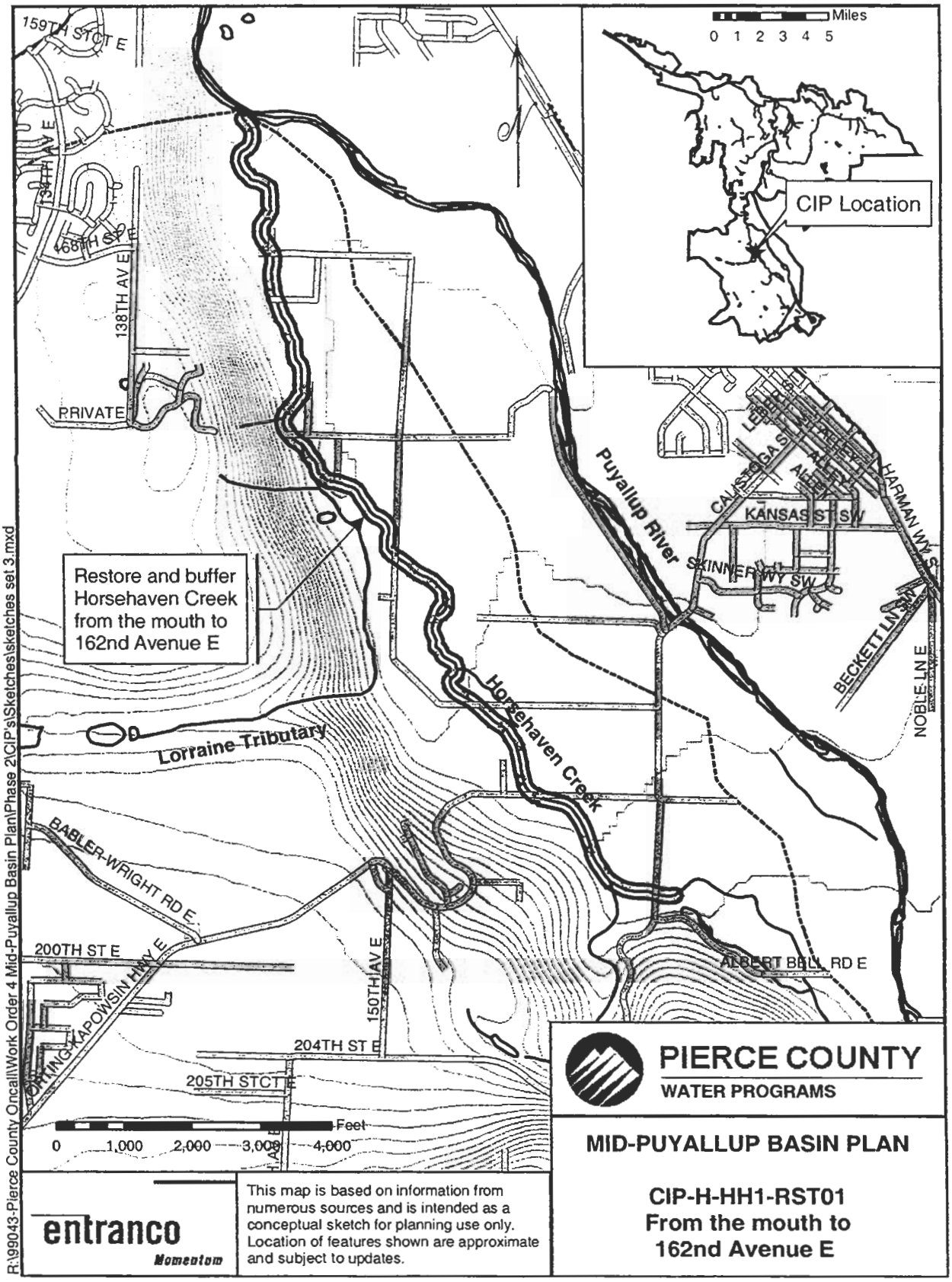
Item	Unit	Unit Cost	Quantity	Cost
Stream Restoration	LF	$ 205	15840	$ 3,247,200
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 3,247,200
			Contingency (20%)	$ 649,440
			Sub-Total	$ 3,896,640
			Engineering and Administration (20%)	$ 779,328
			Total Land Costs	$ -
			*** Project Cost**	**$ 4,675,968**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
159TH ST CT E
34TH AV E
138TH AV E
PRIVATE
Restore and buffer Horsehaven Creek from the mouth to 162nd Avenue E
Puyallup River
Horsehaven Creek
Lorraine Tributary
KANSAS ST SW
SKINNER WY SW
CALISTOGA ST SW
HARMAN WY SW
BECKETT LN SW
NOBLE LN E
BABLER-WRIGHT RD E
200TH ST E
ORTING-KAPOWSIN HWY E
150TH AV E
204TH ST E
205TH ST CT E
ALBERT BELL RD E
0 1,000 2,000 3,000 4,000 Feet
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-H-HH1-RST01
From the mouth to
162nd Avenue E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 3.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-HH4-C05	Subbasin: Horsehaven - HH4	
150th Avenue East, North of 183rd Street Court East		
Description: 150th Avenue Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	7	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)		
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	7	
*b. **Frequency of Flooding – solves an existing problem** (select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	5	
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*		
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	20	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	20	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	10	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	5	
*h. **Provides basin-wide flood reduction benefit** (For programmatic recommendations only)*		
*i. **Provides county-wide flood reduction benefit** (For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**87**	**MEDIUM**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*		
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	10	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	20	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**71**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	10	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*		
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*		
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80	15	
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide water quality benefits** (For programmatic recommendations only)*		
*i. **Provides county-wide water quality benefits** (For programmatic recommendations only)*		
*j. **Solves or substantially reduces an existing problem** (For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**45**	**LOW**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*		
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*		
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	3	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**3**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**206**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Horsehaven Creek Crossing at 150th Avenue E
Project Number: CIP-23-HH4-C05
Project Type: Culvert replacement for flooding
Sub-Basin: HH-4

Existing Conditions: There are twin culverts under 150th Avenue E. Each culvert is a 3-foot precast concrete pipe that is 39 feet long. The property owner has placed boards across the upstream end of these culverts to form a landscaped pond in the front yard. Because of these boards, the Conservation District fish passage inventory lists this culvert as a fish barrier, however, the owner reports that salmonids are seen passing beyond this culvert on a regular basis. These boards are removed during high flows to prevent flooding. This road crossing flooded during the 1996–97 100-year event to a depth of up to six inches and is shown in the model to flood at a 50-year event. Although the flooding here is infrequent, combined with the fish passage issue, it places a greater need on replacing this culvert.

Analysis: The model developed for Horsehaven Creek was used to determine the capacity needed for this culvert.

Proposed Solution/ Project Description Replace the culverts with a single 6-foot circular culvert that is fitted with baffles to provide low-flow restriction for maintaining the upstream pond while also allowing fish passage. Boards can be placed in the narrow section of the baffle to allow adjustment of water level during low flows. The roadway elevation may need to be raised locally as much as one foot to accommodate a culvert of this size.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

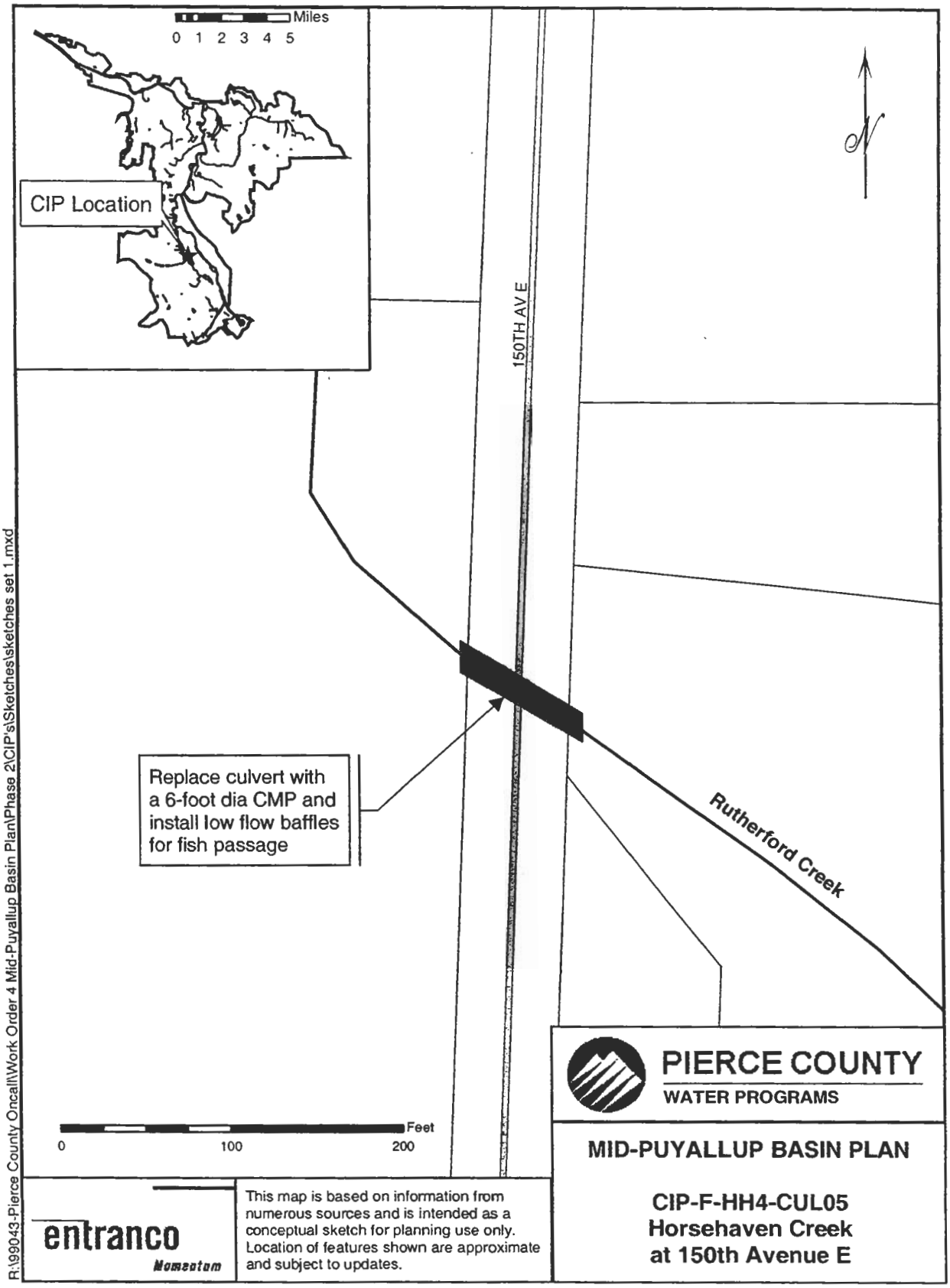
Item	Unit	Unit Cost	Quantity	Cost
72" Diameter Culvert with Baffles	LF	$ 150	39	$ 5,850
Gravel Borrow Incl. Haul	Ton	$ 11	3888	$ 42,768
Removing Asphalt Concrete Pavem	SY	$ 6	3333	$ 19,998
Roadway Excavation Incl. Haul	Ton	$ 11	777	$ 8,547
Crushed Surfacing Base Course	Ton	$ 20	555	$ 11,100
Asphalt Conc. Pavement CL. A	Ton	$ 55	277	$ 15,235
Asphalt Conc. Pavement CL. E	Ton	$ 45	277	$ 12,465
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
			Total	$ 126,213
			Contingency (20%)	$ 25,243
			Sub-Total	$ 151,456
			Engineering and Administration (**%)	
			Total Land Costs	$ -
			*** Project Cost**	**$ 151,456**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
150TH AV E
Replace culvert with a 6-foot dia CMP and install low flow baffles for fish passage
Rutherford Creek
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-HH4-CUL05
Horsehaven Creek
at 150th Avenue E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
R:\99043-Pierce County Oncall\Work Order 4 Mid-Puyallup Basin Plan\Phase 2\CIP's\Sketches\sketches set 1.mxd

CIP Prioritization Worksheet

Project ID: CIP-23-HH5-C07	Subbasin: Horsehaven - HH5	
Location: 188th Street East, West of Orting-Kapowsin Hwy		
Description: 188th Street East Culvert Replacement		

1. FLOOD REDUCTION	SCORE	PRIORITY
5		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	25	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	15	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	10	
b. ***Frequency of Flooding - solves an existing problem*** *(select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. ***Required due to flooding liability*** *(high = 20, medium = 13, low = 7)*		
d. ***Increases capacity of flood plain*** *(high = 20, medium = 13, low = 7)*	20	
e. ***Corrects non-compliance with County design standard (H/D ratio < 1.5)*** *(high = 20, medium = 13, low = 7)*	20	
f. ***Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area*** - *High = 15, Medium = 10, Low = 5*	15	
g. ***Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later*** - *High = 15, Medium = 10, Low = 5*	15	
h. ***Provides basin-wide flood reduction benefit*** *(For programmatic recommendations only)*		
I. ***Provides county-wide flood reduction benefit*** *(For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**145**	**MEDIUM**

2. WATER QUALITY IMPROVEMENT		
a. ***Reduces sources of or impacts from emission of fine sediments*** *(high = 20, medium = 13, low = 7)*	20	
b. ***Reduces sources of or impacts from emission of heavy metals*** *(high = 20, medium = 13, low = 7)*	20	
c. ***Reduces sources of or impacts from emission of excess nutrients*** *(high = 20, medium = 13, low = 7)*	20	
d. ***Reduces sources of or impacts from excess oxygen demanding conditions*** *(high = 20, medium = 13, low = 7)*		
e. ***Reduces sources of or impacts from emission of oil and grease*** *(high = 20, medium = 13, low = 7)*	20	
f. ***Reduces sources of emission of pathogens such as fecal coliform*** *(high = 30, medium = 20, low = 10)*	10	
g. ***Lowers water temperature, provides more shade*** *(high = 30, medium = 20, low = 10)*	20	
h. ***Provides basin-wide water quality benefits*** *(For programmatic recommendations only)*		
i. ***Provides county-wide water quality benefits*** *(For programmatic recommendations only)*		
j. ***Solves or substantially reduces an existing problem*** *(For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**110**	**MEDIUM**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. ***Improves and/or protects habitat for aquatic species*** *(high = 30, medium = 20, low = 10)*	20	
b. ***Improves and/or protects habitat for terrestrial species*** *(high = 20, medium = 13, low = 7)*		
c. ***Increases proportion of native plant species*** *(high = 10, medium = 7, low = 3)*	7	
d. ***Improves flow regime and/or natural hydrology*** *(high = 10, medium = 7, low = 3)*	10	
e. ***Increases channel stability/reduces erosion*** *(high = 5, medium = 3, low = 1)*	5	
f. ***Increases extent of salmonid spawning habitat*** *(Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. ***Salmonids other than cutthroat trout present*** *(high = 5, medium = 3, low = 1)*	5	
h. ***Provides basin-wide water quality benefits*** *(For programmatic recommendations only)*		
i. ***Provides county-wide water quality benefits*** *(For programmatic recommendations only)*		
j. ***Solves or substantially reduces an existing problem*** *(For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**47**	**LOW**

4. OTHER FACTORS		
a. ***Provides recreational or multiple use opportunities*** *(high = 10, medium = 7, low = 3)*		
b. ***Enhances visual aesthetic of area*** *(high = 10, medium = 7, low = 3)*		
c. ***Provides public education opportunities*** *(high = 10, medium = 7, low = 3)*		
d. ***Is a highly visible project or has been on the CIP needs list multiple years.*** *(high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**0**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**302**	**MEDIUM**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Horsehaven Creek Crossing at 188th Street E
Project Number: CIP-23-HH5-C07
Project Type: Culvert replacement for flooding
Sub-Basin: HH-5

Existing Conditions: The 36-inch precast concrete culvert under 188th Street E on Horsehaven Creek floods over the roadway in storms less than the 10-year event. This road runs across the valley bottom and is very flat at the point where it crosses Horsehaven Creek.

Analysis: Replacement of this culvert will need to comply with the requirements for fish passage. Culverts sized for fish passage typically exceed the necessary flow capacity. Therefore, the conceptual solution for this culvert uses the fish passage criteria presented in the WDFW Fish Passage Design at Road Crossings Manual. Average stream width was estimated to be 6 feet. The model developed for Horsehaven Creek was used to verify that this culvert is adequate for carrying flood flows.

Proposed Solution/ Project Description Replace the existing culvert with a 12-foot by 5-foot culvert countersunk to 2 feet to allow for fish passage.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

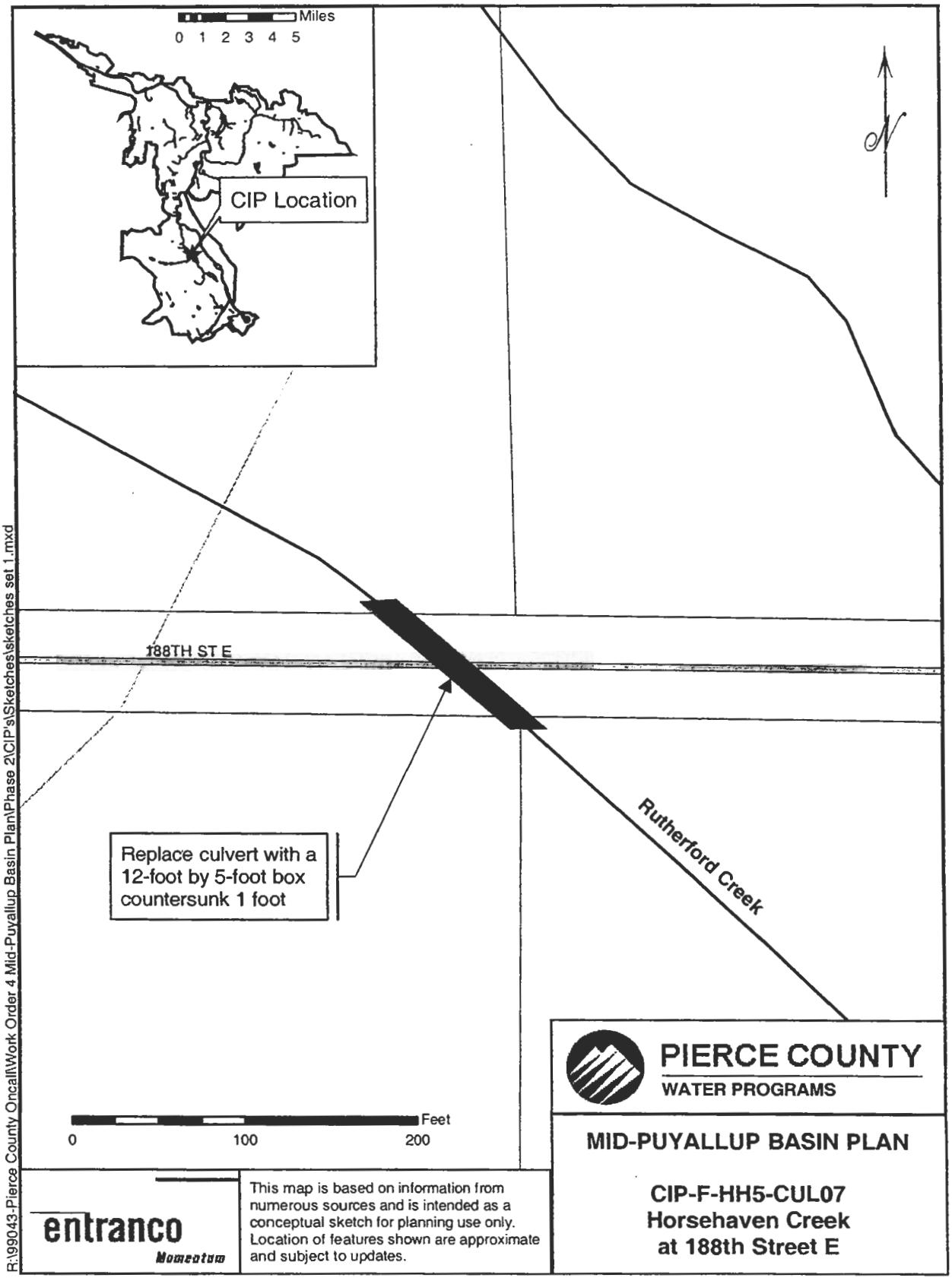
Item	Unit	Unit Cost	Quantity	Cost
5' x 12' Box Culvert	LF	$ 1,245	34	$ 42,330
Streambed Gravel	Ton	$ 33	41	$ 1,353
Stream Restoration	LF	$ 205	50	$ 10,250
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 53,933
			Contingency (20%)	$ 10,787
			Sub-Total	$ 64,720
			Engineering and Administration (35%)	$ 22,652
			Total Land Costs	$ -
			*** Project Cost**	**$ 87,371**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
188TH ST E
Rutherford Creek
Replace culvert with a 12-foot by 5-foot box countersunk 1 foot
Feet
0
100
200
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-HH5-CUL07
Horsehaven Creek
at 188th Street E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-HH8-RST02	Subbasin: Horsehaven - HH8	
Location: Jansky Road		
Description: Jansky Road Channel Stabilization		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	25	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	13	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	15	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	10	
b. Frequency of Flooding – solves an existing problem		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*	15	
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	10	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*	5	
c. Required due to flooding liability (high = 20, medium = 13, low = 7)	20	
d. Increases capacity of flood plain (high = 20, medium = 13, low = 7)	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) (high = 20, medium = 13, low = 7)	20	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - High = 15, Medium = 10, Low = 5	15	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - High = 15, Medium = 10, Low = 5	15	
h. Provides basin-wide flood reduction benefit (For programmatic recommendations only)		
i. Provides county-wide flood reduction benefit (For programmatic recommendations only)		
TOTAL FLOODING SCORE (Maximum Score of 185)	208	HIGH
2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments (high = 20, medium = 13, low = 7)	20	
b. Reduces sources of or impacts from emission of heavy metals (high = 20, medium = 13, low = 7)	7	
c. Reduces sources of or impacts from emission of excess nutrients (high = 20, medium = 13, low = 7)	7	
d. Reduces sources of or impacts from excess oxygen demanding conditions (high = 20, medium = 13, low = 7)		
e. Reduces sources of or impacts from emission of oil and grease (high = 20, medium = 13, low = 7)	7	
f. Reduces sources of emission of pathogens such as fecal coliform (high = 30, medium = 20, low = 10)	20	
g. Lowers water temperature, provides more shade (high = 30, medium = 20, low = 10)	10	
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	71	LOW
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species (high = 30, medium = 20, low = 10)	10	
b. Improves and/or protects habitat for terrestrial species (high = 20, medium = 13, low = 7)		
c. Increases proportion of native plant species (high = 10, medium = 7, low = 3)	3	
d. Improves flow regime and/or natural hydrology (high = 10, medium = 7, low = 3)	10	
e. Increases channel stability/reduces erosion (high = 5, medium = 3, low = 1)	5	
f Increases extent of salmonid spawning habitat ('Q = (Good(ft) + Fair(ft)) / (Total (ft)))		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present (high = 5, medium = 3, low = 1)		
h. Provides basin-wide water quality benefits (For programmatic recommendations only)		
i. Provides county-wide water quality benefits (For programmatic recommendations only)		
j. Solves or substantially reduces an existing problem (For programmatic recommendations only)		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	28	LOW
4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities (high = 10, medium = 7, low = 3)		
b. Enhances visual aesthetic of area (high = 10, medium = 7, low = 3)	7	
c. Provides public education opportunities (high = 10, medium = 7, low = 3)	7	
d. Is a highly visible project or has been on the CIP needs list multiple years. (high = 10, medium = 7, low = 3)	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	24	MEDIUM
TOTAL PROJECT SCORE (Maximum Score 545)	**331**	**HIGH**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Jansky Road Channel Stabilization
Project Number: CIP-23-HH8-RST02
Project Type: Channel stabilization/restoration
Sub-Basin: HH-8

Existing Conditions: Severe erosion is occurring on Horsehaven Creek just upstream of twin 24-inch driveway culverts along the north side of Jansky Road. There are no anadromous fish this high in the watershed, but erosion sends sediment to downstream spawning reaches.

Analysis: Field visits were made to assess the extent of erosion.

Proposed Solution/ Project Description: Stabilize the channel upstream of the existing twin 24-inch driveway culverts to prevent further erosion. Install a rock sill to hold sediment where the gradient begins to drop. Below the rock sill, install one or two log drops to anchor the gradient. Plant the banks with willows and fence it off from livestock to maintain channel stability.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

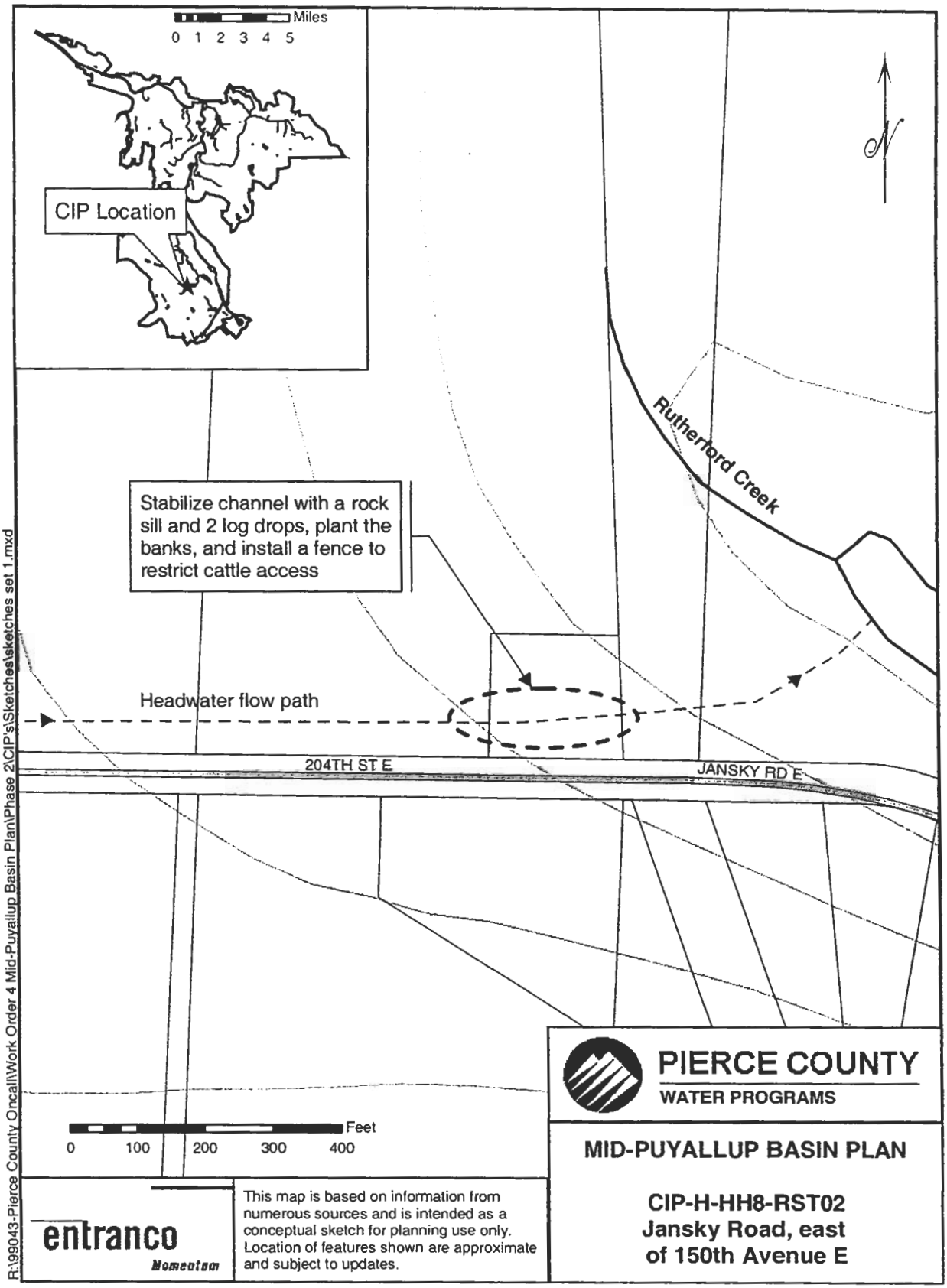
Item	Unit	Unit Cost	Quantity	Cost
Stream Restoration	LF	$ 205	150	$ 30,750
Gabions - 2 level	SY	$ 100	14	$ 1,400
Log weirs	each	$ 5,000	2	$ 10,000
Fencing	LF	$ 10	300	$ 3,000
Planting				$ 10,000
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 55,150
			Contingency (20%)	$ 11,030
			Sub-Total	$ 66,180
			Engineering and Administration (35%)	$ 23,163
			Total Land Costs	$ 10,000
			*** Project Cost**	**$ 99,343**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
N
Rutherford Creek
Stabilize channel with a rock sill and 2 log drops, plant the banks, and install a fence to restrict cattle access
Headwater flow path
204TH ST E
JANSKY RD E
Feet
0 100 200 300 400
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-H-HH8-RST02
Jansky Road, east
of 150th Avenue E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-D1-AC01	Subbasin: Direct Discharge - D1	
Location: 149th Avenue off of 244th Street East		
Description: Flooded Property Acquisition		
1. FLOOD REDUCTION	**SCORE**	**PRIORITY**
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	10	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	7	
b. Frequency of Flooding - solves an existing problem *(select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	10	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*		
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area *- High = 15, Medium = 10, Low = 5*	10	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later *- High = 15, Medium = 10, Low = 5*	10	
h. Provides basin-wide flood reduction benefit *(For programmatic recommendations only)*		
i. Provides county-wide flood reduction benefit *(For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**72**	**LOW**
2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*		
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*		
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*		
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*		
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*		
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*		
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*		
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**0**	**LOW**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*		
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*		
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*		
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*		
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*		
f Increases extent of salmonid spawning habitat *(Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*		
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
I. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**0**	**LOW**
4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*		
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*		
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*		
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**0**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**72**	**LOW**

Project Name: 149th Avenue E off of 244th Street E
Project Number: CIP-23-D1-AC01
Project Type: Property acquisition
Sub-Basin: D-1

Existing Conditions: Flooding occurs on two lots along 149th Avenue E from a drainage way that passes water under 224th Street E. This is in an area of closed depressions with no surface water routes to carry water out of the area.

Analysis: Field assessments were conducted to evaluate this problem.

Proposed Solution/ Project Description Purchase the two properties that are flooding (parcel numbers 0418135050 and 0418135049). Remove these two homes and allow flood waters to infiltrate on site.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
Residential Parcels	AC	$ 65,000	2.52	$ 163,800
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 163,800
			Contingency (20%)	$ 32,760
			Total Land Costs	**$ 196,560**

*** Construction Costs**

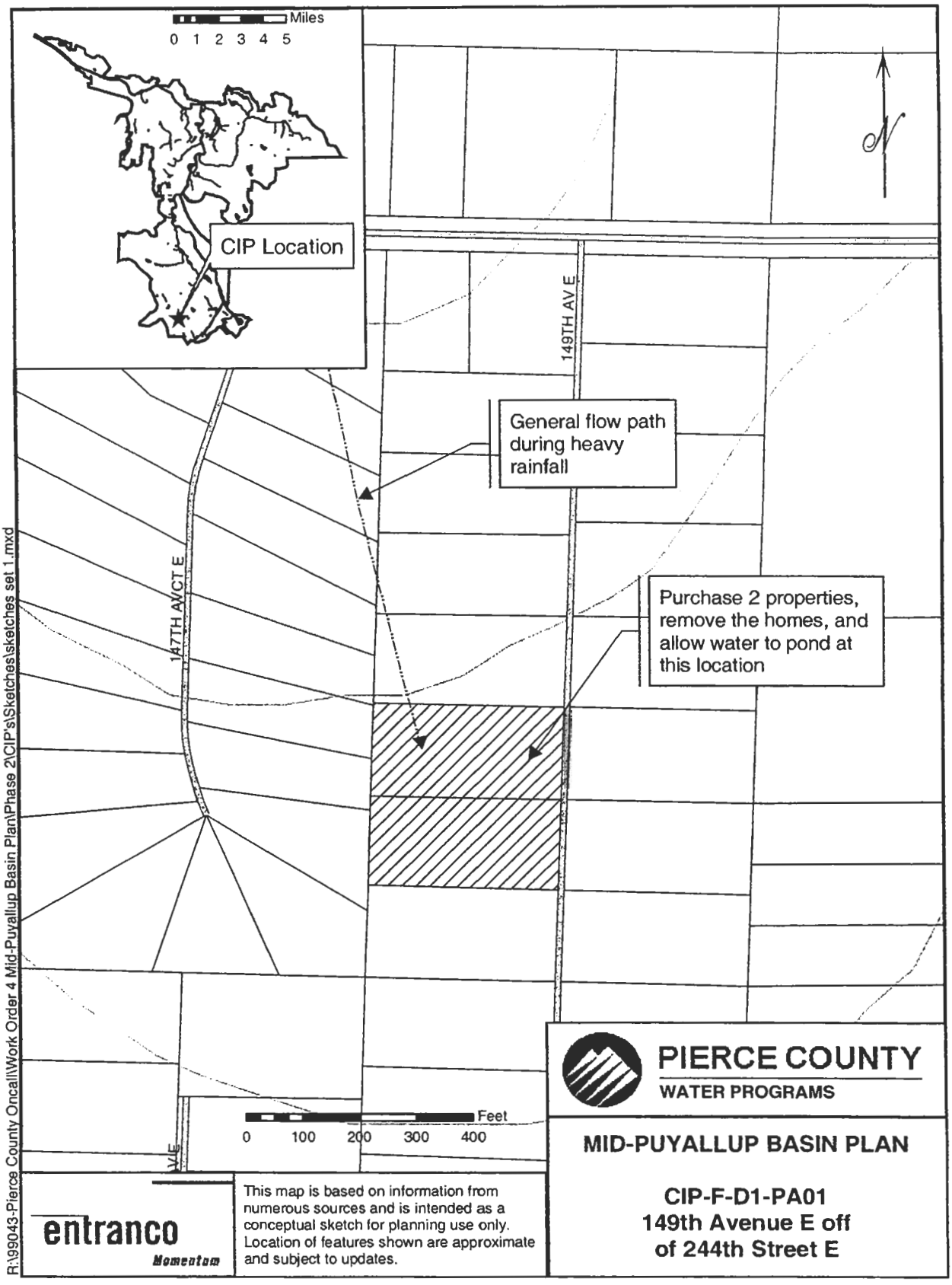
Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Sub-Total	$ -
			Engineering and Administration (35%)	$ -
			Total Land Costs	$ 196,560
			*** Project Cost**	**$ 196,560**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	0

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.


Miles
0 1 2 3 4 5
CIP Location
149TH AV E
General flow path during heavy rainfall
147TH AV CT E
Purchase 2 properties, remove the homes, and allow water to pond at this location
Feet
0 100 200 300 400
PIERCE COUNTY
WATER PROGRAMS
MID-PUYALLUP BASIN PLAN
CIP-F-D1-PA01
149th Avenue E off of 244th Street E
entranco
Momentum
This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.
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CIP Prioritization Worksheet

Project ID: CIP-23-D17-RF03	Subbasin: Direct Discharge - D17	
Location: Freeman Road and 50th Street East		
Description: Freeman Road Conveyance Improvements		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	5	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)		
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)		
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	10	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	7	
b. Frequency of Flooding – solves an existing problem *(select & score one)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*		
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*	10	
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*		
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*	20	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*		
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area *- High = 15, Medium = 10, Low = 5*	5	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later *- High = 15, Medium = 10, Low = 5*	5	
h. Provides basin-wide flood reduction benefit *(For programmatic recommendations only)*		
i. Provides county-wide flood reduction benefit *(For programmatic recommendations only)*		
TOTAL FLOODING SCORE (Maximum Score of 185)	**62**	**LOW**

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*		
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*		
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*		
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*		
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*		
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*		
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*		
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL WATER QUALITY SCORE (Maximum Score 160)	**0**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*		
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*		
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*		
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*		
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*		
f Increases extent of salmonid spawning habitat *(Q = (Good(ft) + Fair(ft)) / (Total (ft)))*		
Opens passage to long reach of habitat (>4000 ft) Q*80		
Opens passage to medium reach of habitat (1000 - 4000 ft) Q*65		
Opens passage to short reach of habitat (<1000 ft) Q*50		
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*		
h. Provides basin-wide water quality benefits *(For programmatic recommendations only)*		
i. Provides county-wide water quality benefits *(For programmatic recommendations only)*		
j. Solves or substantially reduces an existing problem *(For programmatic recommendations only)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 160)	**0**	**LOW**

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*		
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*		
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*		
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*		
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**0**	**LOW**
TOTAL PROJECT SCORE (Maximum Score 545)	**62**	**LOW**

Note: See "Prioritization Narrative" for guidance and descriptions in scoring each category.

Project Name: Neighborhood Flooding along Freeman Road E
Project Number: CIP-23-D17-RF03
Project Type: Road drainage conveyance improvement
Sub-Basin: D-17

Existing Conditions: Flooding along Freeman Road between 45th Street E and 52nd Street E occurs because water collects along the roadside and has no clearly defined flow path. The roadway itself does not flood, but runoff from the road contributes to water ponding on adjacent private properties.

Analysis: The Pierce County drainage inventory was reviewed to identify existing drainage pathways in this area. No drainage infrastructure is recorded for Freeman Road. Field visits were made to evaluate design options for this site. This site was determined to be a good candidate for a low-impact approach because much of the flooding here consists of water ponding at the shoulder of the road.

Proposed Solution/ Project Description Construct bioretention swales to hold roadway runoff from minor events and infiltrate it. Install 12-inch culverts across driveways with inverts set at the top elevation of the bioretention swale to carry high flows south to the wetland at the corner of Freeman Road and 52nd Street E.

Design Assumptions:

*** Land Costs**

Item	Unit	Unit Cost	Quantity	Cost
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ -
			Contingency (20%)	$ -
			Total Land Costs	$ -

*** Construction Costs**

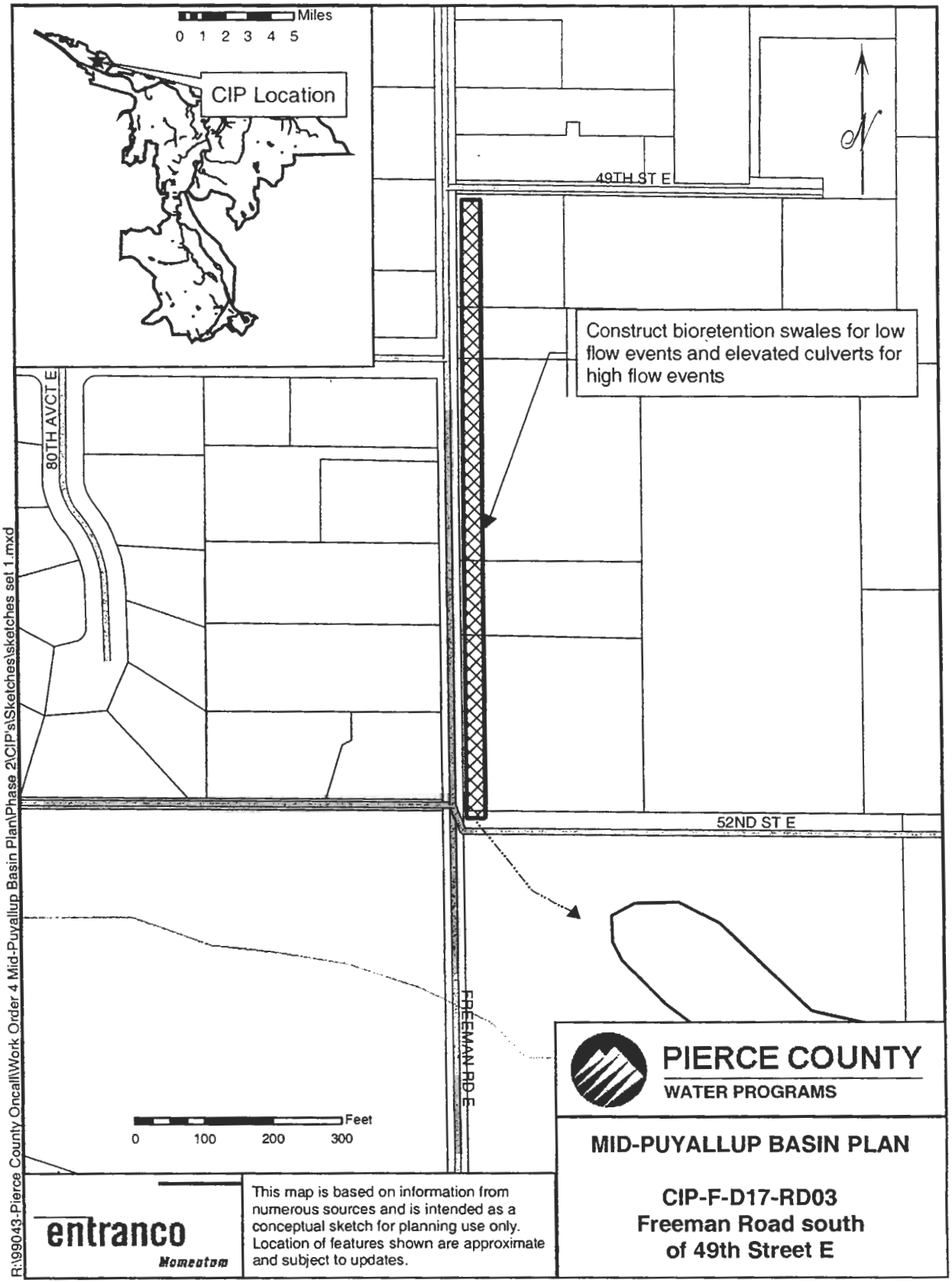
Item	Unit	Unit Cost	Quantity	Cost
Bioswale Excavation	CY	$ 35	836	$ 29,260
Topsoil Type A	CY	$ 30	334	$ 10,020
Bioswale Grass Mix	LB	$ 42	10	$ 420
12" Driveway Culvert (10)	LF	$ 65	150	$ 9,750
12" Road Culvert (2)	LF	$ 65	56	$ 3,640
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
			Total	$ 53,090
			Contingency (20%)	$ 10,618
			Sub-Total	$ 63,708
			Engineering and Administration (35%)	$ 22,298
			Total Land Costs	$ -
			*** Project Cost**	**$ 86,006**

Project Prioritization Summary	
Flood Hazard Reduction	
Water Quality Improvement	
Natural Resource Protection	
Other Factors	
Total Score	**0**

Cost/Benefit Ratio:
(Cost/Priority Score)

** 35% for construction costs up to $100,000
25% for construction cost between $100,000 - $250,000
20% for construction cost above $250,000

* The estimated costs are based on year 2003 dollars.



PIERCE COUNTY
WATER PROGRAMS

MID-PUYALLUP BASIN PLAN

CIP-F-D17-RD03
Freeman Road south of 49th Street E

entranco
Hometown

This map is based on information from numerous sources and is intended as a conceptual sketch for planning use only. Location of features shown are approximate and subject to updates.

Narrative of Benefits

1) FLOOD REDUCTION –

Existing Conditions - Full points can be added to each applicable category.

a) Level of Flooding (check all that apply)
   1) Prevents inconvenience flooding – yards, driveways, minor streets where alternate route is readily available)
   2) Prevents hazard to public safety – This represents closure to arterial road, closure of road where no alternative access is readily available, risk of bridge damage, or flooding that will greatly exacerbate a water quality problem.
   3) Prevents risk to critical facilities – Critical facilities as defined in County Code include medical facilities, schools (including day-care structures), structures housing toxic or explosive substances, and structures with occupancy of greater than 5,000 people. This will also include sewer pump stations and water supply facilities.
   4) Prevents severe property damage (>$100,000/year)
   5) Prevents minor property damage (<$100,000/year)

b) Frequency of flood prevention (score one)
   1) Prevents annual flooding
   2) Prevents flooding every 1 to 5 years
   3) Prevents flooding every 5 to 25 years
   4) Prevents flooding less that one in 25 years

c) Required Due to Flooding Liability – CIP is required by lawsuit, settlement, policy, code, or executive order.

d) Increases capacity of flood plain.

e) Correct Non-compliance with County Design Standard – To be applied when problems are related to public infrastructure such as culverts and ponds that do not conform to current County design standards.

Future Flood Hazard – This category recognizes that even under current regulations new developments have negative impacts on flooding and water quality by increasing the volume of runoff coming from a site and also the amount of pollutants which might not be captured in constructed water quality facilities. Within areas that are slated for growth under the Pierce County Comprehensive Plan it can be estimated that amount of change in these factors. As areas develop project costs such as land acquisition become increasingly expensive and therefore opportunities should be taken advantage of as early as possible to foresee future problems and build or preserve facilities. Scoring for this category should be based on the level of change an area is slated for and the protection that is deemed necessary for downstream environment.

f) Level of increase in flooding (peak rate or volume) or water quality problems that are anticipated due to landuse changes within the area of the problem. (score one)
   1) High
   2) Medium
   3) Low

g) Estimated opportunity to doing the project now in feasibility and cost benefit verses waiting and doing project later. (score one)
   1) High
   2) Medium
   3) Low

2) WATER QUALITY IMPROVEMENT – Although water quality improvements are often closely tied with decreased levels of flow, which were addressed in section 1, this section addresses individual water quality impacts and potential improvement. Each category should receive points if the project provides the benefits of that particular category.

a) Reduce sources of or Impacts from emission of fine sediments- Levels of fine sediments tend to increase as an area urbanizes. The most common source is construction sites where soils are disturbed and inadequate source controls are applied. Other sources include logging operations, dirt tracked onto roads from equipment and vehicles, pressure washing of buildings and vehicles, and sand applied to icy roads. Scoring in this category is

based on the ability of the project to capture entrained sediment, or prevent sediment from entering system, or reducing scouring. Decreased or negative points could occur if the project had a high potential of causing increased levels of sediment from the project site, or tended to pass through sediments from upstream.

b) Reduce sources of or impacts from emission of heavy metals – Metals are utilized in many products important to our daily lives. Certain metals, known as heavy metals, wear off of our car brakes and tires, and come from the paint and moss-killing roof strips and herbicides we use at our homes. These metals can cause severe health and reproductive problems in fish and animals that live in water and sediments that become contaminated by runoff. Because many heavy metals adhere to sediment the water quality facilities designed to capture sediments will also capture sediments.

c) Reduce sources of or impacts from emission of excess nutrients – In the context of water quality, nutrients are mainly compounds of nitrogen and phosphorus. When nutrients are allowed to enter waterbodies, undesirable effects such as algae overgrowth, oxygen depletion, channel clogging due to overgrowth of vegetation, and fish and animal death can occur. Sources of nutrients can include fertilizers, failing septic systems, and yard and animal wastes.

d) Reduce sources of or impacts from emission of oxygen demand – Degradable organic matter, such as yard, food and pet wastes, and some chemical wastes, can have a drastic effect on water quality if they are allowed to enter stormwater. As bacteria break down these substances, the oxygen in the water is consumed. This stresses and can eventually kill fish and other creatures in the water.

e) Reduce sources of or impacts emission of oil and grease – Oils and greases can be either petroleum based or food-related sources. Petroleum-based compounds can be immediately toxic to fish and wildlife, and if they reach our drinking water aquifers, will make us sick too. Food-based oils and greases may not be toxic to us, but they can coat fish gills and insects, and suffocate them.
Impervious surfaces within an urban area generate oil and grease from the uses surrounding that surface such as vehicles that use it. Because the impervious surface has no way to capture the oil and grease it is carried downstream with the runoff. There are both mechanical means such as oil/water separators and biological means such as bio-swales and wet ponds to remove the oil and grease from the runoff. Scoring for this category should be based on the effectiveness of the project to remove the pollutants.

f) Reduces sources of or emissions of pathogens such as fecal coliform. – Pathogens such as fecal chloroform are found in urbanizing areas as a result of animal waste, illicit hookup to the storm drainage system, and failing septic systems. Score in this category should be based on the project's ability to reduce the level of pathogens in the system by either correcting the cause or capturing and removing them form the water train.

g) Lowers water temperature/ provides more shade – Scoring for this category should be given if the project will lower temperature in the long term. (So consideration is given after landscaping matures)

3 NATURAL RESOURCE IMPROVEMENT & PROTECTION

a) Improves and/or protects habitat for aquatic species – Many factors affect habitat for aquatic species and are described below. To evaluate the score in this category for each project consider whether the project will improve or protect the following key aquatic-habitat features. In some instances a project may have an unintended consequence of degrading a factor, such as the tendency of some detention ponds to increase water temperature. This degrading factor should be weighed against improvement in other habitat features for whether a score is given in this category.

- ***Riparian Condition.*** Riparian vegetation influences salmon habitat by providing a buffer from upslope activities that can reduce inputs of nutrients and sediments. Riparian vegetation also connects terrestrial and aquatic communities, stabilizes streambanks, and provides vegetative litter and nutrients to the aquatic food web.
- ***Substrate composition and Embeddedness.*** The surface substrate composition is intended to provide an indication of the habitat quality for salmon spawning. Embeddedness represents the percent that interstitial spaces are filled with small grain particles and is used as a measure of fine sediment concentrations in the substrate (May et al. 1997). Embeddedness can affect salmon incubation, emergence, and rearing, as well as benthic biota by decreasing dissolved oxygen concentrations and the available living space
- ***Passage barriers.*** Accessibility to habitat for spawning and rearing is assessed based on the physical conditions that limit access to habitat (WDFW 1999), which would otherwise be used based on channel type and location within the stream network. Barriers include physical constraints such as culverts, velocity, flow, and also could include water quality barriers.

- ***Pool frequency.*** Pool frequency is assessed by the number of pools within a reach. Pools can be encountered on the main channel and on side channels of a stream. Pools provide habitat for juvenile salmon particularly over-wintering habitat.
- ***Large woody debris*** – Large woody debris (LWD) is a ubiquitous component in streams of the Pacific Northwest. LWD performs critical functions in forested lowland streams, including dissipation of flow energy, streambank protection, streambed stabilization, sediment storage, and providing instream cover and habitat diversity.
- ***Water Temperature*** - The primary means nature uses to keep the water in streams cooled is through the vegetative canopy to shade the water. Also when movement of runoff is by shallow groundwater the water is protected from the warming effects of the sun. When areas are urbanized the effects of clearing vegetation and reducing runoff from becoming groundwater by creating impervious areas has a warming effect on waterbodies. Scoring in this category should be based on the project's ability to restore some of the natural systems to cool the waterbodies.

b) Improves and/or protects habitat for terrestrial species - Habitat for terrestrial species could include wetlands, forested areas, or prairie land. Scoring for Improvements could be partial for preservation, especially when existing regulations do not offer necessary protection of habitat. Increased score would be given for enhancement of existing native features or improvement of hydrology.
c) Increase proportion of native plants – Scores for this category recognize the added benefits native species offer to habitat. The score given in this category should be proportional to the effort given increasing the percentage of native plants on a site. Preservation of native plants should not be included in this category because it is specifically looking at improvement in the native plant population.
d) Improves flow regime – Flow regime refers to the rate and volume of runoff from a site. In a natural system much of the rainfall was intercepted in the canopy of the forest and native vegetation or was retained on a sight in small natural depressions. In addition the soil cover that had accumulated over the years had the ability to act like a sponge and retain water to be used by the vegetation and evaporated over time. As land is developed many of these natural functions are interrupted by vegetation being removed, grading smoothing out natural depressions, impervious surfaces covering large quantities of a site, and connecting drainage courses with ditch systems and pipes. This alters the flow regime by producing increased number of peak flow events downstream along with increased volume of runoff from a site. Also shallow groundwater flow is reduced which decreases the base flow of streams during the summer.
Scoring on this category should be base on how much the project restores features of the natural flow regime.
e) Increases channel stability/reduces excess erosion - Bank erosion is a natural process. The location and extent of eroding banks varies naturally according to channel type and under natural conditions is an important process that helps maintain areas of spawning gravel. However, streambank erosion is also typically increased beyond natural levels in urbanized areas. Indicators of bank instability include active erosion (exposed soil and sideslope failures) and artificial streambank protection (levees and riprap). There are a variety of ways to increase channel stability and some may be more favorable then others. Perennial vegetation growing along the bankfull width can provide bank protection and increase bank stability and may be one of the more preferred methods. Armoring a bank with riprap or some other source of protection may stabilize a slope but may score lower because it is not in line with natural methods and usually doesn't solve the source of the problem.
f) Increase the extent of salmonid spawning habitat – Although points have already been given for improvement of habitat for aquatic species this category specifically reflects the opening up of previously closed habitat through the removal of a blockage. The scoring on this category will be based on the following equation
(Q= [Good (ft) * 0.75*Fair (ft)]/ [Total (ft)]
- Good and Fair habitat locations are identified using the Tri-County Urban Stream Baseline Evaluation Method.
- The Length of Good and Fair habitat refers to length of each type habitat upstream of the project until the next upstream barrier.
- Total length refers to the total length of the stream from the project to the next upstream barrier.

Note: Projects should mention in their description whether there are any barriers downstream of the project that should be improved first.
i) Salmonids other than cutthroat trout present - indicates the presence of less common and/or endangered or threatened salmonids in the project area.

4. OTHER FACTORS

a) Provides recreational or multiple use opportunities –

b) Enhances visual aesthetics of area.
c) Provides public educational opportunities
d) Is a highly visible project or has been on the CIP needs list multiple years but hasn't ever ranked high enough to put on the priority list.

APPENDIX K

PROGRAMMATIC MEASURES PRIORITIZATION

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-23-01	Subbasin: Direct Drainage Subbasins (targeted for pilot)	
Location: Mid-Puyallup Basin		
Description: Conduct a Low Impact Development Pilot Study		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	3	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	0	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	5	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	3	
*b. **Frequency of Flooding - solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*	13	
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	0	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	0	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	0	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	15	
*h. **Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	5	
*i. **Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	8	
TOTAL FLOODING SCORE (Maximum Score of 225)	**59**	**LOW**
2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	13	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	13	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	13	
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	13	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	20	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	20	
*h. **Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	10	
*i. **Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	8	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	10	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**127**	**MEDIUM**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	20	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	20	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	10	
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	25	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	10	
*i. **Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	8	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	10	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**123**	**MEDIUM**
4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	7	
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	10	
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**37**	**HIGH**
TOTAL PROJECT SCORE (Maximum Score 695)	**346**	**HIGH**

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-02	Subbasin: All Subbasins in Mid-Puyallup Basin	
Location: Mid-Puyallup Basin		
Description: Update Stormwater Management Standards		
1. FLOOD REDUCTION	**SCORE**	**PRIORITY**
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	5	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	25	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	20	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	15	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	10	
*b. **Frequency of Flooding – solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	13	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*	20	
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	0	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	20	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	0	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	15	
*h. **Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	15	
*i. **Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	25	
TOTAL FLOODING SCORE (Maximum Score of 225)	**183**	**HIGH**
2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	13	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	7	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	7	
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	13	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	10	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	0	
*h. **Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	5	
*i. **Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	8	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	5	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**75**	**MEDIUM**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	20	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	7	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	7	
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	0	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	15	
*i. **Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	25	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**109**	**MEDIUM**
4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	0	
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	0	
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	3	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**13**	**MEDIUM**
TOTAL PROJECT SCORE (Maximum Score 695)	**380**	**HIGH**

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1/20/04

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-03	Subbasin: All Subbasins in Mid-Puyallup Basin	
Location: Mid-Puyallup Basin		
escription: Inspection Increases for Stormwater Compliance Requirements and NPDES permit		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	1	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	0	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	0	
*b. **Frequency of Flooding – solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*	20	
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	0	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	20	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	0	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	10	
*h. **Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	5	
*i. **Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	8	
TOTAL FLOODING SCORE (Maximum Score of 225)	**72**	**LOW**

2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	20	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	20	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	20	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	20	
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	20	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	30	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	10	
*h. **Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	15	
*i. **Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	25	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**195**	**HIGH**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	20	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	13	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	3	
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	7	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
*f **Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	0	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
*h. **Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	15	
*i. **Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	25	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**108**	**MEDIUM**

4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	0	
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	3	
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**23**	**MEDIUM**
TOTAL PROJECT SCORE (Maximum Score 695)	**398**	**HIGH**

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-04	Subbasin: All Subbasins in Mid-Puyallup Basin	
Location: Mid-Puyallup Basin		
Description: Land Acquisition Program		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	1	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	0	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	0	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	0	
***b. Frequency of Flooding - solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
***c. Required due to flooding liability** (high = 20, medium = 13, low = 7)*	0	
***d. Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	0	
***e. Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	0	
***f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	0	
***g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	15	
***h. Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	5	
***i. Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	8	
TOTAL FLOODING SCORE (Maximum Score of 225)	**29**	**LOW**
2. WATER QUALITY IMPROVEMENT		
***a. Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	13	
***b. Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
***c. Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	13	
***d. Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	13	
***e. Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
***f. Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	20	
***g. Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	30	
***h. Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	10	
***i. Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	17	
***j. Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	10	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**140**	**MEDIUM**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
***a. Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	30	
***b. Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	20	
***c. Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	10	
***d. Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	7	
***e. Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	5	
***f Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	48	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
***g. Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
***h. Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	15	
***i. Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	25	
***j. Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**180**	**HIGH**
4. OTHER FACTORS		
***a. Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	10	
***b. Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	10	
***c. Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
***d. Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**40**	**HIGH**
TOTAL PROJECT SCORE (Maximum Score 695)	**389**	**HIGH**

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-05	Subbasin: All Subbasins in Mid-Puyallup Basin	
Location: Mid-Puyallup Basin		
Description: Restoration and Enhancement Program		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. ***Level of Flooding*** *(score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	0	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	0	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	0	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	0	
b. ***Frequency of Flooding – solves an existing problem*** *(select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. ***Required due to flooding liability*** *(high = 20, medium = 13, low = 7)*	0	
d. ***Increases capacity of flood plain*** *(high = 20, medium = 13, low = 7)*	0	
e. ***Corrects non-compliance with County design standard (H/D ratio < 1.5)*** *(high = 20, medium = 13, low = 7)*	0	
f. ***Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area*** - *High = 15, Medium = 10, Low = 5*	0	
g. ***Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later*** - *High = 15, Medium = 10, Low = 5*	10	
h. ***Provides basin-wide flood reduction benefit*** *(high = 15, medium = 10, low = 5)*	0	
i. ***Provides county-wide flood reduction benefit*** *(high = 25, medium = 17, low = 8)*	0	
TOTAL FLOODING SCORE (Maximum Score of 225)	**10**	**LOW**

2. WATER QUALITY IMPROVEMENT		
a. ***Reduces sources of or impacts from emission of fine sediments*** *(high = 20, medium = 13, low = 7)*	13	
b. ***Reduces sources of or impacts from emission of heavy metals*** *(high = 20, medium = 13, low = 7)*	7	
c. ***Reduces sources of or impacts from emission of excess nutrients*** *(high = 20, medium = 13, low = 7)*	7	
d. ***Reduces sources of or impacts from excess oxygen demanding conditions*** *(high = 20, medium = 13, low = 7)*	7	
e. ***Reduces sources of or impacts from emission of oil and grease*** *(high = 20, medium = 13, low = 7)*	7	
f. ***Reduces sources of emission of pathogens such as fecal coliform*** *(high = 30, medium = 20, low = 10)*	20	
g. ***Lowers water temperature, provides more shade*** *(high = 30, medium = 20, low = 10)*	30	
h. ***Provides basin-wide water quality benefits*** *(high = 15, medium = 10, low = 5)*	10	
i. ***Provides county-wide water quality benefits*** *(high = 25, medium = 17, low = 8)*	17	
j. ***Solves or substantially reduces an existing problem*** *(high = 15, medium = 10, low = 5)*	15	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**133**	**MEDIUM**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. ***Improves and/or protects habitat for aquatic species*** *(high = 30, medium = 20, low = 10)*	20	
b. ***Improves and/or protects habitat for terrestrial species*** *(high = 20, medium = 13, low = 7)*	13	
c. ***Increases proportion of native plant species*** *(high = 10, medium = 7, low = 3)*	10	
d. ***Improves flow regime and/or natural hydrology*** *(high = 10, medium = 7, low = 3)*	3	
e. ***Increases channel stability/reduces erosion*** *(high = 5, medium = 3, low = 1)*	3	
f ***Increases extent of salmonid spawning habitat*** *(high = 80, medium = 48, low = 25)*	48	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
g. ***Salmonids other than cutthroat trout present*** *(high = 5, medium = 3, low = 1)*	5	
h. ***Provides basin-wide benefit*** *(high = 15, medium = 10, low = 5)*	15	
i. ***Provides county-wide benefit*** *(high = 25, medium = 17, low = 8)*	17	
j. ***Solves or substantially reduces an existing problem*** *(high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**149**	**HIGH**

4. OTHER FACTORS		
a. ***Provides recreational or multiple use opportunities*** *(high = 10, medium = 7, low = 3)*	10	
b. ***Enhances visual aesthetic of area*** *(high = 10, medium = 7, low = 3)*	10	
c. ***Provides public education opportunities*** *(high = 10, medium = 7, low = 3)*	10	
d. ***Is a highly visible project or has been on the CIP needs list multiple years.*** *(high = 10, medium = 7, low = 3)*	3	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**33**	**HIGH**

TOTAL PROJECT SCORE (Maximum Score 695)	**325**	**MEDIUM**

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PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-06	Subbasin: All Subbasins in Mid-Puyallup Basin	
Location: Mid-Puyallup Basin		
Description: Education, Outreach, and Technical Assistance Program		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	3	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	10	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	10	
***b. Frequency of Flooding – solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	13	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
***c. Required due to flooding liability** (high = 20, medium = 13, low = 7)*	0	
***d. Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	0	
***e. Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	0	
***f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	0	
***g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	15	
***h. Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	10	
***i. Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	17	
TOTAL FLOODING SCORE (Maximum Score of 225)	**86**	**MEDIUM**

2. WATER QUALITY IMPROVEMENT		
***a. Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	13	
***b. Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
***c. Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	13	
***d. Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	13	
***e. Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
***f. Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	30	
***g. Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	30	
***h. Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	10	
***i. Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	17	
***j. Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	10	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**150**	**HIGH**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
***a. Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	20	
***b. Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	13	
***c. Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	7	
***d. Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	7	
***e. Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	7	
***f Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	25	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
***g. Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	5	
***h. Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	15	
***i. Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	17	
***j. Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**131**	**MEDIUM**

4. OTHER FACTORS		
***a. Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	3	
***b. Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	7	
***c. Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
***d. Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**30**	**HIGH**
TOTAL PROJECT SCORE (Maximum Score 695)	**397**	**HIGH**

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PG00-07	Subbasin: All Subbasins in Mid Puyallup Basin	
Location: Mid Puyallup Basin		
Description: Monitoring Program		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. *Level of Flooding* (score all that apply)		
Prevents/reduces inconvenience flooding (high = 5, medium = 3, low = 1)	3	
Prevents/reduces hazard to public safety (high = 25, medium = 17, low = 8)	17	
Prevents/reduces risk to critical facilities (hospitals, etc.) (high = 20, medium = 13, low = 7)	7	
Prevents/reduces severe property damage (> $100,000/year) (high = 15, medium = 10, low = 5)	5	
Prevents/reduces minor property damage (< $100,000/year) (high = 10, medium = 7, low = 3)	10	
b. *Frequency of Flooding – solves an existing problem* (select & score **one** only)		
Prevents/reduces annual flooding (high = 20, medium = 13, low = 7)	13	
Prevents/reduces flooding every 1 to 5 years (high = 15, medium = 10, low = 5)		
Prevents/reduces flooding every 5 to 25 years (high = 10, medium = 7, low = 3)		
Prevents/reduces flooding less than one in 25 years (high = 5, medium = 3, low = 1)		
c. *Required due to flooding liability* (high = 20, medium = 13, low = 7)	7	
d. *Increases capacity of flood plain* (high = 20, medium = 13, low = 7)	0	
e. *Corrects non-compliance with County design standard (H/D ratio < 1.5)* (high = 20, medium = 13, low = 7)	0	
f. *Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area* - High = 15, Medium = 10, Low = 5	0	
g. *Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later* - High = 15, Medium = 10, Low = 5	15	
h. *Provides basin-wide flood reduction benefit* (high = 15, medium = 10, low = 5)	5	
i. *Provides county-wide flood reduction benefit* (high = 25, medium = 17, low = 8)	17	
TOTAL FLOODING SCORE (Maximum Score of 225)	99	MEDIUM
2. WATER QUALITY IMPROVEMENT		
a. *Reduces sources of or impacts from emission of fine sediments* (high = 20, medium = 13, low = 7)	7	
b. *Reduces sources of or impacts from emission of heavy metals* (high = 20, medium = 13, low = 7)	7	
c. *Reduces sources of or impacts from emission of excess nutrients* (high = 20, medium = 13, low = 7)	7	
d. *Reduces sources of or impacts from excess oxygen demanding conditions* (high = 20, medium = 13, low = 7)	7	
e. *Reduces sources of or impacts from emission of oil and grease* (high = 20, medium = 13, low = 7)	7	
f. *Reduces sources of emission of pathogens such as fecal coliform* (high = 30, medium = 20, low = 10)	10	
g. *Lowers water temperature, provides more shade* (high = 30, medium = 20, low = 10)	10	
h. *Provides basin-wide water quality benefits* (high = 15, medium = 10, low = 5)	10	
i. *Provides county-wide water quality benefits* (high = 25, medium = 17, low = 8)	8	
j. *Solves or substantially reduces an existing problem* (high = 15, medium = 10, low = 5)	5	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	78	MEDIUM
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. *Improves and/or protects habitat for aquatic species* (high = 30, medium = 20, low = 10)	20	
b. *Improves and/or protects habitat for terrestrial species* (high = 20, medium = 13, low = 7)	7	
c. *Increases proportion of native plant species* (high = 10, medium = 7, low = 3)	3	
d. *Improves flow regime and/or natural hydrology* (high = 10, medium = 7, low = 3)	7	
e. *Increases channel stability/reduces erosion* (high = 5, medium = 3, low = 1)	3	
f *Increases extent of salmonid spawning habitat* (high = 80, medium = 48, low = 25)	0	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
g. *Salmonids other than cutthroat trout present* (high = 5, medium = 3, low = 1)	5	
h. *Provides basin-wide benefit* (high = 15, medium = 10, low = 5)	10	
i. *Provides county-wide benefit* (high = 25, medium = 17, low = 8)	8	
j. *Solves or substantially reduces an existing problem* (high = 15, medium = 10, low = 5)	5	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	68	MEDIUM
4. OTHER FACTORS		
a. *Provides recreational or multiple use opportunities* (high = 10, medium = 7, low = 3)	0	
b. *Enhances visual aesthetic of area* (high = 10, medium = 7, low = 3)	0	
c. *Provides public education opportunities* (high = 10, medium = 7, low = 3)	10	
d. *Is a highly visible project or has been on the CIP needs list multiple years.* (high = 10, medium = 7, low = 3)	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	20	MEDIUM
TOTAL PROJECT SCORE (Maximum Score 695)	265	MEDIUM

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-08	**Subbasin:** All Subbasins	
Location: Mid-Puyallup Basin		
Description: BMP Maintenance Manual		

	SCORE	PRIORITY
1. FLOOD REDUCTION		
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	1	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	5	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	3	
b. Frequency of Flooding – solves an existing problem *(select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*	0	
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*	7	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*	0	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - *High = 15, Medium = 10, Low = 5*	5	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - *High = 15, Medium = 10, Low = 5*	15	
h. Provides basin-wide flood reduction benefit *(high = 15, medium = 10, low = 5)*	10	
i. Provides county-wide flood reduction benefit *(high = 25, medium = 17, low = 8)*	17	
TOTAL FLOODING SCORE (Maximum Score of 225)	**85**	**MEDIUM**
2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*	20	
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*	13	
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*	13	
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*	20	
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*	7	
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*	20	
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*	20	
h. Provides basin-wide water quality benefits *(high = 15, medium = 10, low = 5)*	15	
i. Provides county-wide water quality benefits *(high = 25, medium = 17, low = 8)*	25	
j. Solves or substantially reduces an existing problem *(high = 15, medium = 10, low = 5)*	15	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**168**	**HIGH**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*	30	
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*	13	
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*	10	
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*	10	
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*	5	
f Increases extent of salmonid spawning habitat *(high = 80, medium = 48, low = 25)*	25	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*	5	
h. Provides basin-wide benefit *(high = 15, medium = 10, low = 5)*	10	
i. Provides county-wide benefit *(high = 25, medium = 17, low = 8)*	17	
j. Solves or substantially reduces an existing problem *(high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**140**	**MEDIUM**
4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*	7	
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*	7	
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*	10	
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*	10	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**34**	**HIGH**
TOTAL PROJECT SCORE (Maximum Score 695)	**427**	**HIGH**

PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PG00-09	**Subbasin:** All Subbasins	
Location: Mid Puyallup Basin		
escription: Invasive Species Management Program		

1. FLOOD REDUCTION	SCORE	PRIORITY
*a. **Level of Flooding** (score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	5	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	5	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	7	
*b. **Frequency of Flooding – solves an existing problem** (select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	13	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
*c. **Required due to flooding liability** (high = 20, medium = 13, low = 7)*	13	
*d. **Increases capacity of flood plain** (high = 20, medium = 13, low = 7)*	13	
*e. **Corrects non-compliance with County design standard (H/D ratio < 1.5)** (high = 20, medium = 13, low = 7)*	7	
*f. **Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area** - High = 15, Medium = 10, Low = 5*	10	
*g. **Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later** - High = 15, Medium = 10, Low = 5*	15	
*h. **Provides basin-wide flood reduction benefit** (high = 15, medium = 10, low = 5)*	10	
*i. **Provides county-wide flood reduction benefit** (high = 25, medium = 17, low = 8)*	17	
TOTAL FLOODING SCORE (Maximum Score of 225)	**130**	**MEDIUM**
2. WATER QUALITY IMPROVEMENT		
*a. **Reduces sources of or impacts from emission of fine sediments** (high = 20, medium = 13, low = 7)*	7	
*b. **Reduces sources of or impacts from emission of heavy metals** (high = 20, medium = 13, low = 7)*	7	
*c. **Reduces sources of or impacts from emission of excess nutrients** (high = 20, medium = 13, low = 7)*	20	
*d. **Reduces sources of or impacts from excess oxygen demanding conditions** (high = 20, medium = 13, low = 7)*	7	
*e. **Reduces sources of or impacts from emission of oil and grease** (high = 20, medium = 13, low = 7)*	7	
*f. **Reduces sources of emission of pathogens such as fecal coliform** (high = 30, medium = 20, low = 10)*	10	
*g. **Lowers water temperature, provides more shade** (high = 30, medium = 20, low = 10)*	20	
*h. **Provides basin-wide water quality benefits** (high = 15, medium = 10, low = 5)*	10	
*i. **Provides county-wide water quality benefits** (high = 25, medium = 17, low = 8)*	8	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**111**	**MEDIUM**
3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
*a. **Improves and/or protects habitat for aquatic species** (high = 30, medium = 20, low = 10)*	30	
*b. **Improves and/or protects habitat for terrestrial species** (high = 20, medium = 13, low = 7)*	13	
*c. **Increases proportion of native plant species** (high = 10, medium = 7, low = 3)*	10	
*d. **Improves flow regime and/or natural hydrology** (high = 10, medium = 7, low = 3)*	10	
*e. **Increases channel stability/reduces erosion** (high = 5, medium = 3, low = 1)*	3	
*f **Increases extent of salmonid spawning habitat** (high = 80, medium = 48, low = 25)*	48	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
*g. **Salmonids other than cutthroat trout present** (high = 5, medium = 3, low = 1)*	3	
*h. **Provides basin-wide benefit** (high = 15, medium = 10, low = 5)*	15	
*i. **Provides county-wide benefit** (high = 25, medium = 17, low = 8)*	17	
*j. **Solves or substantially reduces an existing problem** (high = 15, medium = 10, low = 5)*	15	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**166**	**HIGH**
4. OTHER FACTORS		
*a. **Provides recreational or multiple use opportunities** (high = 10, medium = 7, low = 3)*	7	
*b. **Enhances visual aesthetic of area** (high = 10, medium = 7, low = 3)*	10	
*c. **Provides public education opportunities** (high = 10, medium = 7, low = 3)*	10	
*d. **Is a highly visible project or has been on the CIP needs list multiple years.** (high = 10, medium = 7, low = 3)*	3	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**30**	**HIGH**
OTAL PROJECT SCORE (Maximum Score 695)	**437**	**HIGH**

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PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PRG-00-10	Subbasin: All Subbasins	
Location: Mid-Puyallup Basin		
Description: Flood Disclosure Statements in Property Titles		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. Level of Flooding (score all that apply)		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	1	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	8	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*	5	
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	7	
b. Frequency of Flooding – solves an existing problem *(select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	0	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. Required due to flooding liability *(high = 20, medium = 13, low = 7)*	20	
d. Increases capacity of flood plain *(high = 20, medium = 13, low = 7)*	0	
e. Corrects non-compliance with County design standard (H/D ratio < 1.5) *(high = 20, medium = 13, low = 7)*	0	
f. Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area - *High = 15, Medium = 10, Low = 5*	0	
g. Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later - *High = 15, Medium = 10, Low = 5*	10	
h. Provides basin-wide flood reduction benefit *(high = 15, medium = 10, low = 5)*	5	
i. Provides county-wide flood reduction benefit *(high = 25, medium = 17, low = 8)*	5	
TOTAL FLOODING SCORE (Maximum Score of 225)	**68**	**LOW**

2. WATER QUALITY IMPROVEMENT		
a. Reduces sources of or impacts from emission of fine sediments *(high = 20, medium = 13, low = 7)*	0	
b. Reduces sources of or impacts from emission of heavy metals *(high = 20, medium = 13, low = 7)*	0	
c. Reduces sources of or impacts from emission of excess nutrients *(high = 20, medium = 13, low = 7)*	0	
d. Reduces sources of or impacts from excess oxygen demanding conditions *(high = 20, medium = 13, low = 7)*	0	
e. Reduces sources of or impacts from emission of oil and grease *(high = 20, medium = 13, low = 7)*	0	
f. Reduces sources of emission of pathogens such as fecal coliform *(high = 30, medium = 20, low = 10)*	0	
g. Lowers water temperature, provides more shade *(high = 30, medium = 20, low = 10)*	0	
h. Provides basin-wide water quality benefits *(high = 15, medium = 10, low = 5)*	0	
i. Provides county-wide water quality benefits *(high = 25, medium = 17, low = 8)*	0	
j. Solves or substantially reduces an existing problem *(high = 15, medium = 10, low = 5)*	0	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**0**	**LOW**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. Improves and/or protects habitat for aquatic species *(high = 30, medium = 20, low = 10)*	0	
b. Improves and/or protects habitat for terrestrial species *(high = 20, medium = 13, low = 7)*	0	
c. Increases proportion of native plant species *(high = 10, medium = 7, low = 3)*	0	
d. Improves flow regime and/or natural hydrology *(high = 10, medium = 7, low = 3)*	0	
e. Increases channel stability/reduces erosion *(high = 5, medium = 3, low = 1)*	0	
f Increases extent of salmonid spawning habitat *(high = 80, medium = 48, low = 25)*	0	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (<1000 ft)		
g. Salmonids other than cutthroat trout present *(high = 5, medium = 3, low = 1)*	0	
h. Provides basin-wide benefit *(high = 15, medium = 10, low = 5)*	0	
i. Provides county-wide benefit *(high = 25, medium = 17, low = 8)*	0	
j. Solves or substantially reduces an existing problem *(high = 15, medium = 10, low = 5)*	0	
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**0**	**LOW**

4. OTHER FACTORS		
a. Provides recreational or multiple use opportunities *(high = 10, medium = 7, low = 3)*	10	
b. Enhances visual aesthetic of area *(high = 10, medium = 7, low = 3)*	0	
c. Provides public education opportunities *(high = 10, medium = 7, low = 3)*	7	
d. Is a highly visible project or has been on the CIP needs list multiple years. *(high = 10, medium = 7, low = 3)*	0	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**17**	**MEDIUM**
TOTAL PROJECT SCORE (Maximum Score 695)	**85**	**LOW**

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PROGRAMMATIC MEASURES Prioritization Worksheet

Project ID: PG00-11	Subbasin: All Subbasins	
Location: Mid Puyallup Basin		
escription: Enhanced Cooperative Arrangements with Cities and Other Jurisdictions		

1. FLOOD REDUCTION	SCORE	PRIORITY
a. ***Level of Flooding*** *(score all that apply)*		
Prevents/reduces inconvenience flooding *(high = 5, medium = 3, low = 1)*	5	
Prevents/reduces hazard to public safety *(high = 25, medium = 17, low = 8)*	17	
Prevents/reduces risk to critical facilities (hospitals, etc.) *(high = 20, medium = 13, low = 7)*	7	
Prevents/reduces severe property damage (> $100,000/year) *(high = 15, medium = 10, low = 5)*		
Prevents/reduces minor property damage (< $100,000/year) *(high = 10, medium = 7, low = 3)*	3	
b. ***Frequency of Flooding – solves an existing problem*** *(select & score **one** only)*		
Prevents/reduces annual flooding *(high = 20, medium = 13, low = 7)*	13	
Prevents/reduces flooding every 1 to 5 years *(high = 15, medium = 10, low = 5)*		
Prevents/reduces flooding every 5 to 25 years *(high = 10, medium = 7, low = 3)*		
Prevents/reduces flooding less than one in 25 years *(high = 5, medium = 3, low = 1)*		
c. ***Required due to flooding liability*** *(high = 20, medium = 13, low = 7)*		
d. ***Increases capacity of flood plain*** *(high = 20, medium = 13, low = 7)*		
e. ***Corrects non-compliance with County design standard (H/D ratio < 1.5)*** *(high = 20, medium = 13, low = 7)*		
f. ***Future Flooding: level of increase in peak discharge that is expected due to land use changes within the project area*** - *High = 15, Medium = 10, Low = 5*	15	
g. ***Estimated benefit to doing the project now (in feasibility and cost benefit) versus waiting and doing project later*** - *High = 15, Medium = 10, Low = 5*	15	
h. ***Provides basin-wide flood reduction benefit*** *(high = 15, medium = 10, low = 5)*	10	
i. ***Provides county-wide flood reduction benefit*** *(high = 25, medium = 17, low = 8)*	17	
TOTAL FLOODING SCORE (Maximum Score of 225)	**102**	**MEDIUM**

2. WATER QUALITY IMPROVEMENT		
a. ***Reduces sources of or impacts from emission of fine sediments*** *(high = 20, medium = 13, low = 7)*	13	
b. ***Reduces sources of or impacts from emission of heavy metals*** *(high = 20, medium = 13, low = 7)*	13	
c. ***Reduces sources of or impacts from emission of excess nutrients*** *(high = 20, medium = 13, low = 7)*	13	
d. ***Reduces sources of or impacts from excess oxygen demanding conditions*** *(high = 20, medium = 13, low = 7)*	13	
e. ***Reduces sources of or impacts from emission of oil and grease*** *(high = 20, medium = 13, low = 7)*	13	
f. ***Reduces sources of emission of pathogens such as fecal coliform*** *(high = 30, medium = 20, low = 10)*	20	
g. ***Lowers water temperature, provides more shade*** *(high = 30, medium = 20, low = 10)*	20	
h. ***Provides basin-wide water quality benefits*** *(high = 15, medium = 10, low = 5)*	10	
i. ***Provides county-wide water quality benefits*** *(high = 25, medium = 17, low = 8)*	17	
j. ***Solves or substantially reduces an existing problem*** *(high = 15, medium = 10, low = 5)*	5	
TOTAL WATER QUALITY SCORE (Maximum Score 215)	**137**	**MEDIUM**

3. NATURAL RESOURCE IMPROVEMENT & PROTECTION		
a. ***Improves and/or protects habitat for aquatic species*** *(high = 30, medium = 20, low = 10)*	10	
b. ***Improves and/or protects habitat for terrestrial species*** *(high = 20, medium = 13, low = 7)*	7	
c. ***Increases proportion of native plant species*** *(high = 10, medium = 7, low = 3)*	7	
d. ***Improves flow regime and/or natural hydrology*** *(high = 10, medium = 7, low = 3)*	3	
e. ***Increases channel stability/reduces erosion*** *(high = 5, medium = 3, low = 1)*	1	
f ***Increases extent of salmonid spawning habitat*** *(high = 80, medium = 48, low = 25)*	25	
Opens passage to long reach of habitat (>4000 ft)		
Opens passage to medium reach of habitat (1000 - 4000 ft)		
Opens passage to short reach of habitat (< 1000 ft)		
g. ***Salmonids other than cutthroat trout present*** *(high = 5, medium = 3, low = 1)*	1	
h. ***Provides basin-wide benefit*** *(high = 15, medium = 10, low = 5)*	5	
i. ***Provides county-wide benefit*** *(high = 25, medium = 17, low = 8)*	8	
j. ***Solves or substantially reduces an existing problem*** *(high = 15, medium = 10, low = 5)*		
TOTAL NATURAL RESOURCE IMPROVEMENT SCORE (Maximum Score 215)	**67**	**MEDIUM**

4. OTHER FACTORS		
a. ***Provides recreational or multiple use opportunities*** *(high = 10, medium = 7, low = 3)*	3	
b. ***Enhances visual aesthetic of area*** *(high = 10, medium = 7, low = 3)*		
c. ***Provides public education opportunities*** *(high = 10, medium = 7, low = 3)*	3	
d. ***Is a highly visible project or has been on the CIP needs list multiple years.*** *(high = 10, medium = 7, low = 3)*	3	
TOTAL OTHER FACTORS SCORE (Maximum Score 40)	**9**	**LOW**
OTAL PROJECT SCORE (Maximum Score 695)	**315**	**MEDIUM**

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